CCS Technical Documentation
RH-10 Series Transceivers

Troubleshooting

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Transmitter Troubleshooting

The Diva troubleshooting section includes tuning information, troubleshooting test, probing points, and block diagrams.

Tuning Information

ST Batman VHFPLL

This is one of the phone's self-tests, which gives either a Pass or Fail result only.

The VHFPLL is inside the Batman IC. The phone checks the VHFPLL's lock detect bit. If this bit indicates that the PLL is unlocked, the test will fail.

Manual Verification: Turn on the Cell or PCS receiver to any channel and probe at L701 (probing point 39 in Figure 2), using an RF probe connected to a spectrum analyzer tuned to 256.2 MHz. If the PLL is locked, it will be stable in frequency. If it is unlocked, you may have to use a wide span to see it since it may be far off frequency.

Troubleshooting: Check C701, C714, R703, R702, C715, R704, V701, C716, L701, and C702. Check power supplies to Batman, particularly check for 2.7v on VR5 at C710 and on VR7 at C708. Check for 1.8v on VIO. If no fault is found, replace N701 (Batman).

ST TX Detector Cell

This is one of the phone's self-tests, which gives either a Pass or Fail result only.

The phone transmits at several power levels and checks the ADC value of the power detector. The ADC value is measured first for a set of AGC values, and then each AGC value is changed individually to ensure that the ADC changes as each AGC change is made.

Manual Verification: Using Main Mode, turn on the Cell CDMA TX with the channel set to 384 and turn on IS95 modulation using CDMA control. Using the PDM window, set:

TX_IF_AGC to -100

TX_RF_AGC to -512

PA_AGC to +511

Record the TX signal power from the antenna connector, using a spectrum analyzer centered at 836.52 MHz. (The self-test measures the power detector reading instead, but at the present time it cannot be done with Phoenix. An easy way to check functionality without removing the covers is to check transmitted power.) Transmitter power should be greater than 24 dBm. (PWR_OUT greater than 1.91v, which corresponds to the power detector ADC=700.)

For each of the next three cases, TX power should be less than 24 dBm (less than 1.91v on PWR_OUT).

1 TX_IF_AGC to -80
TX_RF_AGC to -512
PA_AGC to -512

2 TX_IF_AGC to +511
TX_RF_AGC to -512
PA_AGC to +511

3 TX_IF_AGC to -80
TX_RF_AGC to +511
PA_AGC to +511

Troubleshooting: If there is a failure associated with only some of the cases above, check the AGC voltages and components of the associated PDMs as described in Tables 1 and 4. For problems with the IF or RF AGC, also check Robin and supporting components. For PA AGC problems, also check the PA and supporting components. If all the above cases fail, troubleshoot the TX chain as described in this section.

If all the output powers pass, perhaps the test is failing because the ADC voltage is wrong. The limit is 1.64v. If the voltages are wrong, then check the power detector at R821, R801, R804, L801, C805, R806, R805, C803, V801, C804, and C807, and also Robin. If the voltages are correct and it still fails, check the UEM (D200).

ST Robin VHFPLL Cell

This is one of the phone's self-tests, which gives either a Pass or Fail result only.

The VHFPLL is inside the Robin IC. The phone checks the VHFPLL's lock-detect bit. If this bit indicates that the PLL is unlocked, the test will fail.

Manual Verification: Turn on the Cell CDMA receiver to any channel and probe at L611 (probing point 11, Figure 1), using an RF probe connected to a spectrum analyzer tuned to 346.2 MHz. If the PLL is locked, it will be stable in frequency. If it is unlocked, you may have to use a wide space to see it since it may be far off frequency.

Troubleshooting: Check C612, C613, R607, R605, C632, R606, C638, L611, C631, C630, V601, C629, V602, C637, R609, C618. Check power supplies to N601 (Robin), ensuring 2.7v on VR3 and VR6, and 1.8v on VIO. If no problems are found, replace Robin.

SN Cell PA Temp

This is one of the phone's self-tunings, which reads the ADC voltage of thermistor R808, and checks to make sure the phone is at room temperature. A phone should not be tuned while it is either hot or cold.

The phone reports the ADC voltage value of the thermistor and it should be within the set limits.

Manual Verification: Ensure the phone is cool by letting it cool down for several minutes. Retest, keeping in mind that if there is a short circuit on the board, the phone will get

hot very quickly.

Troubleshooting: If the phone was recently transmitting in Cell band at full power for an extended period of time, it is probably hot for that reason. Let it cool down for a few minutes before proceeding. If it still fails, there may be either a short on the board or a problem with the PA Temp circuitry. To check PA Temp circuitry, check R808, C232, R202, and D200. If a short is suspected, check the Cell PA first. If an infrared camera is available, this is one of the easiest methods to detect a short.

SN Cell RX BB Filter

This is one of the phone's self-tunings, which tunes the lowpass filter in the Batman IC (N701), in Cell CDMA mode.

This self-tuning returns one of the filters tuned parameters, which should be within the set limits.

Manual Verification: Use "RF Tuning" dialog box in Phoenix; set mode to Self Tune, and choose this tuning.

Troubleshooting: Check Batman (N701) and supporting components.

SN Cell RX DC Offset I (or Q)

This is one of the phone's self-tunings, which measures and adjusts the cell band CDMA receiver DC offsets until they are within the set limits.

The DC offset is returned for I (or Q).

Manual Verification: Use "RF Tuning" dialog box in Phoenix; set mode to Self Tune, and choose this tuning.

Troubleshooting: Check Batman (N701) and supporting components.

SN AMPS RX BB Filter

This is one of the phone's self-tunings, which tunes the lowpass filter in the Batman IC (N701), in AMPS mode.

This self-tuning returns one of the filters tuned parameters, which should be within the set limits.

Manual Verification: Use the "RF Tuning" dialog box in Phoenix; set mode to Self Tune, and choose this tuning.

Troubleshooting: Check Batman (N701) and supporting components.

SN AMPS RX DC Offset I (or Q)

This is one of the phone's self-tunings, which measures and adjusts the cell band CDMA receiver DC offsets until they are within the set limits.

The DC offset is returned for I (or Q).

Manual Verification: Using the "RF Tuning" dialog box in Phoenix, set mode to Self Tune, and choose this tuning.

Troubleshooting: Check Batman (N701) and supporting components.

Test TX Start-up Current

This test turns on the AMPS transmitter (PCS transmitter for PCS-only phones) and measures current of the whole phone—which can detect some assembly errors.

Manual Verification: Set the phone to local mode and turn on the AMPS transmitter. Set the PDM values as listed in Table 1a for AMPS Power Level 5 (for PCS, set output power to +12dBm). Read the phone's current on the power supply and check to see that it is within the set limits. If the power supply does not display current draw, use a current meter in series with the phone. If the phone powers down when the mode is set, it may be that the phone is drawing more current than the current limit setting on the power supply.

Troubleshooting: If current is very high, there may be a short circuit on the phone caused by a solder bridge, a failed component that is internally shorted, a component placed with the wrong rotation, or some other reason. Short circuits can be difficult to find, but one of the easiest methods is to use a thermal camera and look for hot spots that are not normally hot. Look for the hottests spots. A visual inspection can find solder bridges or wrong component rotations. A failed component can be found by functional tests of the phone's sub-blocks.

Test TX Start-up Amplitude

This test turns on the AMPS transmitter and checks for the presence of a TX signal with an amplitude within a specified range. A wide range is allowed since the transmitter is not yet tuned.

Manual Verification: Set the phone to local mode and turn on the AMPS transmitter set to channel 384. Set the AGC PDM values as in Test 17. Look for an output signal at 836.52 MHz with an amplitude within the set limits. The frequency of the signal may not be accurate since the VCTCXO has not been tuned yet.

Troubleshooting: Check proper placement, rotation, and soldering of the components of the TX chain, as shown in Figure 1. Check for the presence of LO tones as listed in Table 2. Check for the presence of a TX signal at each point in the TX chain, probing according to Table 2.

TN VCTCXO Frequency

The purpose of this tuning is to determine what the AFC DAC value needs to be in order to center the VCTCXO frequency. The PCS transmitter is turned on and no TX baseband modulation is provided. The carrier then is centered in frequency. This is done to the carrier after it has been mixed up to 1880 MHz, since it is easier to measure the tolerance of

1 ppm at 1880 MHz than it is at 19.2 MHz. Additionally, the tone at 1880 MHz can be measured without taking the phone apart.

The result of this test is a PDM value for the AFC DAC, which must be within +/- 150, corresponding to 2.2v on the VCTCXO control pin (pin 1) and the carrier centerd within +/- 100Hz. The VCTCXO must be able to be centered within a certain voltage range in order to allow for aging of the crystal (the centering voltage slowly drifts over time and the phone will eventually run out of voltage range if it begins too close to the edge of the range).

Manual Verification: Using the "RF Main Mode" dialog box in Phoenix, turn on the PCS transmitter and set it to channel 600. Do not add any modulation. Using the RF Tuning window, set Mode=RF Tuning, and choose this tuning. Look for a transmitted tone on the spectrum analyzer at 1880 MHz. If no tone is present, proceed to *Troubleshooting* below.

Center the carrier to within +/- 100 Hz of 1880 MHz. (If sidetones are present, be careful to center the carrier and not one of the sidetones.) The values you enter into the Values edit box are the AFC values that control the VCTCXO frequency. Start with a value of "0", adjusting until it is centered, staying within the set limits.

Troubleshooting:

1 If there is no tone, probe pin 3 of G501 for a tone at 19.2 MHz. If this is not present, check power supplies, particularly ensuring 2.7v on VCTCXO Vcc pin, pin 4 of G501. Also check the control pin (pin 1 of G501) for a voltage between 0.4 and 2.7v. If the voltages are correct, and soldering of all G501 terminals is correct, replace G501. If 19.2 MHz tone is present but tone at 836.52 MHz is not, troubleshoot **Cell TX Chain** section.

2 If the carrier is present but the PDM needed to center it is outside of the +/- 150 range, or if it cannot be centered, there is a hardware problem.

3 In the following procedure, performing frequency centering on the RF carrier at 1880 MHz will detect frequency errors due to the VCTCXO and supporting hardware, which will be the majority of the problems, but will not detect frequency errors due to the hardware that mixes the VCTCXO tone at 19.2 MHz up to 1880 MHz. In order to also troubleshoot this hardware, frequency centering should be performed on the 19.2 MHz tone to +/- 19.2 Hz on pin 3 of G501, using a frequency counter. Then the VHF and UHF LOs should be checked. *(Since this will be time-consuming and will probably only account for a small percentage of the failures, it is not recommended unless the situation justifies the time spent.)* The VHF LO is inside the Robin IC (N601) and troubleshooting of the Cell UHF LO is according to Table 2.

4 If the carrier can be centered, but the PDM is out-of-range, check the control voltage on pin 1 of G501. If it is 2.2v (and pin 4 is at 2.7v and pin2 at 0v), then the VCTCXO (G501) is working correctly but the circuit that delivers the control voltage is not. Check soldering of all G501 terminals; also check R510, R511,

C503, and D200. If the control voltage on pin 1 of G501 is not 2.2v, but the carrier is centered, then there is a problem with the VCTCXO G501. If there is 2.7v on pin 4 and the soldering is correct, then replace G501.

5 If the carrier cannot be centered, check to see if you can adjust to 2.2v on pin 1 of G501. If you can, within the PDM range of +/- 150, then the circuitry that delivers the voltage is working correctly, and the VCTCXO has a problem. Troubleshoot as described in the previous section. If you cannot adjust to 2.2v within the accepted range, then the AFC circuitry has a problem. Troubleshoot it as described in the previous section.

6 If there is a fault with both the AFC circuitry and the VCTCXO, then several combinations of the previously described conditions are possible. Start by ensuring 2.2v on pin 1 of G501, using a PDM within the range of +/- 150. Then center the phone.

TN TX DC Offset Reference Power

Both this tuning and the next (**TN TX DC Offset Carrier Suppression**) are to adjust the DC offset voltages on the I and Q inputs to the modulator for minimal carrier feedthrough (maximum carrier suppression). Initially, the DC offsets are set to a nominal value, and the power of a tone offset in frequency 20 kHz from the carrier is measured in dBm and recorded as a reference (in this tuning). Then, in the next tuning, the carrier suppression (delta between center tone and tone that is offset 20 kHz) is measured. If it passes, it is reported in that tuning. If not, the DC offsets are adjusted until it passes, and the passing value is reported.

The reported result is the power in dBm of the tone that is offset 20 kHz from the carrier, as measured on the antenna connector, with the nominal DC offsets applied.

Manual Verification: In Phoenix, use the RF Main Mode dialog box to set the AMPS transmitter to channel 384. Using the RF Tuning dialog box, set the I and Q DC offsets to 0,0 by entering 0,0 in the Values edit box. Center the transmit signal on the spectrum analyzer, set the span to 100 kHz. Lower the bandwidth so that the two sidetones can be differentiated from the carrier. Measure the amplitude of the sidetone at 20 kHz above the carrier. The amplitude of the sidetone will probably be higher than that of the carrier. The amplitude should be within the test limits.

Troubleshooting: If the carrier is not present, troubleshoot the cell TX chain using the "things to check" list and probing table/diagrams. If the two tones offset at 20 kHz are not present, check for them with an oscilloscope on one of the four pads of probing point 1 in Figure 1, being very careful not to short the pad to an adjacent pad. The frequency should be 20 kHz. If tone is not present on these four pads, then there is a problem with D200 (UEM). If the tones are present at probing point 1 but not on the TX signal, check to see if they are on Robin output at L613 at 836.52 MHz + 20 kHz. If not, there is a problem with N601 (Robin). Ensure power supplies to Robin (VR2, VR3, VR6, and VIO) are correct. Check components around Robin. If still failing, replace Robin.

TN TX DC Offset Carrier Suppression

(See **TN TX DC Offset Reference Power**) tuning section. This step reports the delta between the reference at 836.52 + 20 kHz and the minimum carrier level at 836.52 MHz.

The result is a delta in dB between the reference at 836.52 MHz + 20 kHz and the minimum carrier level at 836.52 MHz found by adjusting the DC offsets for I and Q individually. The delta should be at least 35 dB.

Manual Verification: Set up the phone as in the previous test, and record the reference power of the offset tone. Measure the delta between the center and offset tones. If the delta is 35 dB or greater, the phone passes. If less than 35 dB, vary the "I" DC offset on the "Values" line in the RF Tuning dialog box, using the values listed below until the minimum carrier maximum delta is found. Leave Q at 0. On the "Values" line, enter "I,Q". The appropriate values (in decimal) are:

-560
-504
-448
-392
-336
-280
-224
-168
-112
-56
0
56
112
168
224
280
336
302
448
504
560

If the minimum is 35 dB or greater, the phone passes. If the minimum is less than 35 dB, then vary Q in the same manner as I, using the above values, holding I constant at the minumum value determined above, until the delta is at least 35 dB.

Troubleshooting: Check N601 (Robin), D200 (UEM), and associated components.

TN TX IF AGC Cell Po (0) [or (1), (2), (3), or (4)]

The IF gain curve is characterized by varying the TX_IF_AGC and measuring the transmit power. This is only done once (in cell CDMA mode) since the same circuitry is used for both cell.

The results are TX power readings in dBm of the transmitted signal corresponding to given PDM settings of the Cell TX IF AGC.

Manual Verification: Set the phone in local mode; then program it to Cell CDMA RX/TX mode on channel 384. Set modulation to IS95 voice. Set the Cell PA PDM to +218 decimal and the TX RF AGC to -512 decimal, using the sliders in the PDM dialog box under the RF drop-down menu. Change the TX_IF_AGC to the settings in the following table and measure the TX power levels, checking to see that they are within the specified range.

PDM for TX IF AGC	Acceptable range for output power (in dBm)
(a) +300 decimal	check tuning
(b) +150	results file
(c) 0	for limits

Change the TX_RF_AGC PDM to +511. Leave the TX_IF_AGC at 0 and the PA_AGC at +218. Measure the output power. Subtract this power from the power measured in (c) above. This is the RF_AGC gain delta.

Leave the PA_AGC and TX_RF_AGC values as is; then enter the alues listed below for the TX_IF_AGC. Measure the output power, then add to each the RF_AGC gain delta calculated above. Check that these sums are within the listed ranges.

PDM for TX IF AGC	Acceptable range for sum:[output power + RF_AGC gain delta], in dBm
-200	check tuning results
-400	file for limits

Troubleshooting: Check Robin (N801) and supporting components. Also check D400, which generates the PDM signals. Check AGC PDM voltages according to Tables 1 and 4. Troubleshoot the rest of the transmitter chain, if necessary.

TN PA Gain Cal Cell Po (0) [or, (1), (2), (3), (4), or (5)]

These tunings model the cell PA gain curve by setting the PA AGC PDM to several values and measuring output power. First, the TX PA AGC and the TX RF AGC are set to (approximately) their maximum used values (not the maximum possible values, but the maximum of the range over which they are used). Then, the TX IF AGC is set so that the transmit power on the antenna connector is approximately +11 dBm (this power is reported in the next tuning, **TX TX IF 11 dBm Set CELL Po**). Then, six PDM values are written to the PA AGC and the output power is measured for each. These values are reported in this tuning. The software then performs curve fitting to interpolate between the measured data points.

The result is the transmitted power in dBm for each of the six PA AGC PDM settings (results labeled 0 through 5).

Manual Verification: Turn on the cell CDMA transmitter in Phoenix, using the RF Main Mode dialog box, and set it to channel 384. Set modulation to IS95 voice.

Set the TX_IF_AGC PDM to 0 decimal.

Set the PA AGC PDM to +218 decimal.

Set the TX RF AGC PDM to -512 decimal.

Adjust the TX IF AGC PDM so that the transmitted tone at 836.52 MHz measures +11 dBm +/- 0.5 dB on the antenna connector, using a spectrum analyzer (use 0 as a starting point).

Note the value obtained in the step above as it will be needed in other Troubleshooting sections.

Write the PDM values listed in the following table into the PA AGC and record the output power. Check to see if the output power is within the ranges listed on the tuning result printout. (Limits are not provided in this document as they may change.)

PDM for PA AGC	Acceptable range for output power (in dBm)
+218 decimal	limit range for Po(5)
-12	limit range for Po(4)
-202	limit range for Po(3)
-268	limit range for Po(2)
-329	limit range for Po(1)
-366	limit range for Po(0)

Troubleshooting: If the power readings are low, check the AGC voltages as given in Tables 1 and 4. You can also probe on the PA input as given in Table 2 to find out if the power level is going into the PA, or if the power level is correct going into the PA but the PA gain is too low. If the power level going into the PA is too low, probe the TX chain at all the other points prior to the PA listed in the table to see where the gain is lacking. When that point is identified, check the soldering of all related components, and replace components until the fault is found. If the power on the PA input is not low and the PA AGC voltage is correct, similarly probe the power at all points after the PA to find the fault—being extremely careful not to short the probing point to ground because this will instantly destroy the PA. Visually check soldering first, and probe on PA output as a last resort.

TX TX IF 11 dBm Set CELL Po

See previous tuning (**TN PA Gain Cal Cell Po (0) [or, (1), (2), (3), (4), or (5)]**). This is the part of the previous tuning when the TX IF AGC is adjusted so that the output power is +11 dBm.

The result is a power in dBm. A perfect result would be +11.00 dBm.

Manual Verification: See previous section.

Troubleshooting: See previous section.

TN TX RF AGC Cell Po (0) [or (1), or (2)]

This tuning characterizes the RF AGC curve by entering PDM values to the RF AGC and measuring the output power.

The results are TX power readings in dBm of the transmitted signal measured for each of the listed PDM settings of the Cell TX RF AGC.

Manual Verification: Set up the transmitter as described in tuning 24.3 above.

Set the Cell PA PDM to -329.

Set the TX_IF_AGC to the value determined in tuning 24.3 above to give +11 dBm on the output.

Change the TX RF AGC to the settings in the following table, and measure the TX power levels. Check to see that they are within the specified range.

PDM for TX RF AGC	Acceptable range for output power, in dBm
-512 decimal	check
-67 decimal	limits
-22 decimal	in tuning
+418	results
+511	file

Troubleshooting: Check Robin (N801) according to Tables 1, 2, and 4. Also check D400, which generates the PDM signals. Check AGC PDM voltages according to Table 1. Troubleshoot the rest of the cell transmitter, if needed.

TN TX Gain Comp Cell Po MD (or LO, LM, ML, MH, HM, or HI)

Both this tuning and the next (**TX IF dBm Set Cell Po**) ensure that the value of TxdBCtr correctly corresponds to the absolute TX output power. On the midchannel, with TxdBCtr set to a specified value, G_Offset is adjusted so that the output power is -8 dBm and that value of G-Offset is recorded (which is an absolute value) in the next tuning. (The output power in dBm is recorded in this tuning.) After this is done on the midchannel, the channel is changed to each of the other channels and output power is reported. (G_Offset is not adjusted on the other channels as it was on the center channel — just the output power is recorded.)

The result is the transmitted power in dBM, which should be -8.0 dBm +/- 0.5 dB on the center channel.

Manual Verification: Set the phone to local mode and program it to Cellular (or PCS) CDMA RX/TX mode on channel 384 (or 600 for PCS), using the Main Mode dialog box.

Using the Phoenix RF Tuning dialog box, choose "mode" = RF Tuning and choose this test. Adjust G_Offset in the "values" dialog box line until the TX output power (measured on the RF connector with a spectrum analyzer) is equal to -8.0 dBm +/- 0.5 dB. Use the G_Offset limit range as a guide to which values to enter.

Once this is done on the center channel, change to each of the other channels and record the power. Do not adjust G_Offset on the other channels—just record the power. It should be within the limits listed in the tuning results file.

Channel	Cell
Low	991
LowMid	107
MidLow	245
Mid	384
MidHigh	512
HighMid	660
High	799

Troubleshooting: If -8 dBm cannot be attained, troubleshoot Cell TX.

TX IF 11 dBm Set CELL Po

See the previous tuning (**TN TX Gain Comp Cell Po MD (or LO, LM, ML, MH, HM, or HI)**). This is the part of the previous tuning when the TX IF AGC is adjusted so that the output power is +11 dBm.

The result is a power in dBm. A perfect result would be +11.00 dBm.

Manual Verification: See previous tuning.

Troubleshooting: See previous tuning.

TN TX RF AGC Cell Po (0) [or (1), or (2)]

This tuning characterizes the RF AGC curve by entering PDM values to the RF AGC and measuring the output power.

The results are TX power readings in dBm of the transmitted signal measured for each of the listed PDM settings of the Cell TX RF AGC.

Manual Verification: Set up the transmitter as described in tuning 24.3 above.

Set the Cell PA PDM to -329.

Set the TX_IF_AGC to the value determined in tuning 24.3 above to give +11 dBm on the output.

Change the TX RF AGC to the settings in the following table, and measure the TX power levels. Check to see that they are within the specified range.

PDM for TX RF AGC	Acceptable range for output power, in dBm
-512 decimal	check
-67 decimal	limits
-22 decimal	in tuning
+418	results
+511	file

Troubleshooting: Check Robin (N801) according to Tables 1, 2, and 4. Also check D400, which generates PDM signals. Check AGC PDM voltages according to Table 1. Trouble-shoot the rest of the cell transmitter, if needed.

TN TX Gain Comp Cell (or PCS) Po MD (or LO, LM, ML, MH, HM, or HI)

Both this tuning and the next (**TN G_Offset Cell MD**) ensure that the value of TxdBCtr correctly corresponds to the absolute TX output power. On the midchannel, with TxdBCtr set to a specified value, G_Offset is adjusted so that the output power is -8 dBm, and that value of G_Offset is recorded (which is an absolute value) in the next tuning. (The output power in dBm is recorded in this tuning.) After this is done on the midchannel, the channel is changed to each of the other channels, and output power is reported. (G_Offset is not adjusted on the other channels as it was on the center channel—just the output power is recorded.)

The result is the transmitted power in dBm, which should be -8.0 dBm +/- 0.5 dB on the center channel.

Manual Verification: Set the phone to local mode and program it to Cellular (or PCS) CDMA RX/TX mode on channel 384 (or 600 for PCS), using the Main Mode dialog box.

Using the Phoenix RF Tuning dialog box, choose "mode" = RF Tuning, and choose this test. Adjust G_Offset in the "values" dialog box line until the TX output power (measured on the RF connector with a spectrum analyzer) is equal to -8.0 dBm +/- 0.5 dB. Use the G_Offset limit range as a guide to which values to enter.

Once this is done on the center channel, change to each of the other channels and record the power. Do not adjust G_Offset on the other channels—just record the power. It should be within the limits listed in the tuning results file.

Channel	Cell
Low	991
LowMid	107
MidLow	245
Mid	384
MidHigh	512
HighMid	660
High	799

Troubleshooting: If -8 dBm cannot be attained, troubleshoot Cell TX.

TN G_Offset Cell MD

See previous tuning (**TN TX Gain Comp Cell (or PCS) Po MD (or LO, LM, ML, MH, HM, or HI)**). This step reports G_Offset.

The result is the value of G_Offset, which gives -8.0 dBm transmitted power.

Manual Verification: See the previous tuning. This is the value of G_Offset needed to get -8 dBm on the center channel.

Troubleshooting: If G_Offset is not within the limits, troubleshoot the Cell TX.

TN AMPS PL2 Po Mid (or Low, LowMid, MidLow, MidHigh, HighMid, or High)

This procedure tunes the AMPS transmit Power Level 0 on seven channels by adjusting TxdBCtr. The channels are: Low=991, LowMid=107, MidLow=245, Mid=384, MidHigh=521, HighMid=660, High=799. The algorithm then interpolates between the measured points for frequency compensation.

The result is measured transmit power in dBm for power level 0 on each of the seven channels.

Manual Verification: Set the phone to local mode and turn on the AMPS transceiver to the channel that failed.

Using the Phoenix RF Tuning dialog box, set "mode"=RF Tuning, and select this test. Adjust TxdBCtr in the "values" dialog box until the output power is within the limits (adjusting for cable loss).

Troubleshooting: Troubleshoot the cell transmitter, setting the TX AGC values to those listed for Power Level 0 in Table 1.

TN AMPS PL3 (or 4, 5, 6, or 7) Po

This procedure tunes power levels 3 through 7, all on the center channel. (Power level 0 was tuned in the previous test. Power levels 1 and 2 are the same as 0 for this phone.)

The result is measured trasmit power in dBm for power levels 3 through 7 on channel 384.

Manual Verification: Use the same procedure as in the previous tuning (**TN AMPS PL2 Po Mid (or Low, LowMid, MidLow, MidHigh, HighMid, or High)**), but on channel 384 note that the limits are different from the previous tuning.

Troubleshooting: Trouble the cell transmitter, setting the AGCs as in Table 1 for the power level that failed.

TN TX Limiting Po Cell IS95, Low channel (or LowMid, MidLow, Mid, MidHigh, HighMid, or High channel)

This tuning provides an upper limit on the transmit power while in Cell IS95 mode. The reason for this is to ensure that the phone never violates the SAR (Specific Absorption Ratio) limit, which is a health and safety specification that limits the amount of radiation near the user's head. The phone is set to transmit and TxdBCtr is adjusted for the maximum transmit power.

The result is a power level in dBm, which is the maximum allowed. This is done on each of the seven channels.

Manual Verification: Using Phoenix, set the phone to local mode; then turn on the Cell transmitter set to each of the channels in the following list.

Using the RF Tuning dialog box, adjust TxdBCtr in the "values" dialog box until the TX power—measured on the RF connector with a spectrum analyzer—is within the limits on each of the following channels.

Channel	Cell
Low	991
LowMid	107
MidLow	245
Mid	384
MidHigh	512
HighMid	660
High	799

Troubleshooting: If the maximum cannot be reached, either a component in the transmitter has too much loss, or not enough gain. Troubleshoot the Cell transmitter with the phone set to the same channel as the failed channel.

TN TX Limiting Cell CDMA2000: Po

This is the same as the previous tuning (**TN TX Limiting Po Cell IS95, Low channel (or LowMid, MidLow, Mid, MidHigh, HighMid or High channel)**), except that CDMA2000 (C2K) modulation is used instead of IS95.

For an explanation of result, see the previous tuning.

Manual Verification: Same as the previous tuning, except choose the CDMA2000 tuning in the RF Tuning dialog box.

Troubleshooting: Same as previous tuning.

TS ACPR Cell — Low

See the description for PCS ACPR. In cell band, however, the offset is -0.9 MHz (+0.9 MHz).

Manual Verification: Set up the measurement as described in *section 42.3* but turn on the Cell transmitter to channel 384. Likewise, use the TxdBCtr value for Cell TX Limiting on channel 384 in IS95 mode. Measure at the center frequency of 836.52 MHz, and the offset of +/- 0.9 MHz.

Troubleshooting: Refer to *section 42.3* and also the Cell TX troubleshooting guide. Cell band TX decoupling capacitors are C653, C633, C649, C648, C619, C841, C817, C810, C811, C803.

TN RX IF AGC RXdBCtr (0) [or (1) or (2)]

This tuning calibrates the RX IF AGC curve, because the output power of the IF part of the Batman IC is not a linear function of RX_IF_AGC. The tuner injects three known signal power levels into the phone's receiver and, for each one, the phone's AGC algorithm adjusts the RX_IF_AGC to get the same amplitude at the output of Batman (although different amplitudes are going in). From these three points, curve fitting is used to interpolate between measurement points.

The result is a value of RxdBCtr (which corresponds to a value of RX_IF_AGC) for each of three CW input powers injected into the receiver:

-87.5 dBm, -57 dBm, and -18 dBm

Manual Verification: With the phone in local mode, use the Main Mode dialog to turn on the AMPS receiver set to channel 384. Using the RF Tuning dialog, perform the manual tuning three times—each time injecting the CW signal at the amplitudes listed above; one amplitude per tuning. Each time, record RxdBCtr—which is returned by Phoenix during the manual tuning. For the manual tuning, use the RF Tuning dialog box with "mode"= RF Tuning, and choose the appropriate tuning name. Ensure that the resulting value of RxdBCtr is within the limits in the tuning results file.

Troubleshooting: While injecting a signal into the receiver, check the values of RSSI and

RX_IF_AGC PDM value and, if needed, voltage. RSSI should be within +/- 2 dB of the actual power in dBm on the RF connector. The AGC will try to keep the same amplitude on Batman output; therefore, if the AGC value is larger than normal, this indicates that the AGC is compensating for loss in the chain prior to the variable gain amplifier.

After checking RSSI and AGC value, if it is still necessary to probe to pinpoint the source of the error, use the *AMPS probing tables*.

TN LNA AMPS (or Cell) LowGain (or HighGain) LO (or LM, ML, MD, MH, HM, HI)

This tuning records RxdBCtr (which is automatically adjusted to produce the same amplitude on the receiver output no matter what the input is) for the receiver with the LNA in HighGain mode, and again with the LNA in LowGain mode. For AMPS, this is done only on the center channel. For Cell and PCS, it is done over several channels.

The result is a value of RxdBCtr.

Manual Verification: Using Phoenix, choose this tuning in the RF Tuning dialog box. Inject a CW signal that is 10 kHz offset from the center frequency of the channel that is being tuned. For AMPS, set the amplitude to -65 dBm. For both Cell and PCS, set the amplitude to -95 dBm. Record RxdBCtr, which is returned from Phoenix in the lowest field in the RF Tuning dialog box.

Troubleshooting: Check Alfred and supporting components.

Final UI Test: Rho

Rho is a measure of CDMA transmit signal quality, which encompasses other transmitter indicators such as phase error and magnitude error. Rho is measured with the phone in a phone call, and is read directly from the call box. Rho is measured with the sector power = -75 dBm. If Rho fails, check the signal purity of the LOs. Check synthesizer components and power supply decoupling.

Final UI Test: Frame Error Rate (FER)

This measurement—also made while in a phone call—measures the frame errors of the receiver in CDMA mode. A low amplitude signal (typically at a receiver sensitivity level of -104 dBm), is injected into the receiver, and the FER is recorded. FER is measured in percentage (0.5% or lower is considered passing). Failures are most often caused by excess loss/insufficient gain in the receiver chain. Failures may also be the result of excess noise in the receiver. Check for correct signal levels and AGC values/voltages.

Final UI Test: SINAD

SINAD (Signal-to-Noise-and-Distortion) is similar to a sensitivity/FER measurement for CDMA, but it is used in AMPS. A low-level signal (typically at sensitivity level of -116.0 dBm) is injected into the receiver, and SINAD is read off the call box. The passing limit is 12 dB.

Probing/Troubleshooting

Overview

When measuring CDMA transmit signals, if the spectrum analyzer does not have a CDMA personality card, the CDMA signal power can be approximated by setting the resolution bandwidth to 1 MHz and using the marker. CDMA signal power is measured by integrating power over a 1.23 MHz bandwidth while the marker measures power at only one frequency.

Probing is generally done in local mode, although situations may arise whereby the troubleshooter may need to probe while in a call. If this is done, be aware that in some cases, probing may disturb the circuit so that the call drops.

The following tables list power levels for many combinations of AGC values; however, it generally is only necessary to check one combination. Likewise, although probing points and signal level information are given for each point in the receiver and transmitter chains, the troubleshooter is not expected to probe each point on every phone. Only the suspect trouble spots should be probed.

Absolute power measurements were made with an Agilent (HP) 85024A active high impedance probe. While other probes may be used, it is strongly recommended that the probe be high impedance so that the measurement does not load the circuit. Adjust absolute measurements if the probe has a different gain or if a probe attenuator is used.

If a range is provided for loss, typically the higher loss occurs at the band edges.

Power depends on the impedance of the circuit. For example, if a circuit has a nominal loss of 5 dB, then straightforward probing on the input and output, then subtracting, might not result in 5 dB because the input impedance might be different from the output impedance. However, after mathematically adjusting the power on either the input or output to compensate for the difference in impedance, 5 dB is then calculated. Most components in the RF section have the same input and output impedance (50 ohms), but where this is not the case, absolute power is noted in the tables in dBm, rather than loss or gain in dB.

When testing the CDMA receiver, it is easier to inject a CW tone into the receiver. The gains and losses will be the same for a CW signal as for CDMA.

Probing Tables

Table 1: Transmit Output Power and Associated AGC PDM values and voltages

channel 384							
AMPS							
TX RF AGC		TX IF AGC		Probed RF power on Balun Out	PA AGC		RF power on RF connector
PDM value	voltage	PDM value	voltage		PDM value	voltage	
typical	v	typical	v	dBm	typical	v	dBm
-409	0.17	-102	0.70	-11.2 +/- 3 dB	-19	0.84	25.5 (PL0)
-409	0.17	-89	0.72	-13.2 +/- 3 dB	-123	0.66	24.2 (PL3)
-409	0.17	-73	0.75	-15.4 +/- 3 dB	-310	0.34	19.9 (PL4)
-249	0.44	-63	0.77	-19.2 +/- 3 dB	-330	0.30	15.8 (PL5)
-104	0.70	-53	0.78	-22.4 +/- 3 dB	-330	0.30	12.5 (PL6)
37	0.95	-48	0.79	-27.9 +/- 3 dB	-330	0.30	8.2 (PL7)
CELL CDMA							
-403	0.17	-115	0.66	-16 +/- 3 dB	220	1.27	25
-403	0.17	116	1.08	-42 +/- 3 dB	-270	0.40	-2
200	1.23	124	1.09	-58 +/- 3 dB	-331	0.29	-23
450	1.68	124	1.09	-65 +/- 3 dB	-331	0.29	-39
511	1.78	207	1.24	-75 +/- 3 dB	-331	0.29	-50

Note: AGC PDM values will change (sometimes drastically) as the phone warms up. The table lists PDM values for initial power up. After 10 minutes at full power, PDM values will be different.

Table 2: RF/Analog Probing for Transmitter

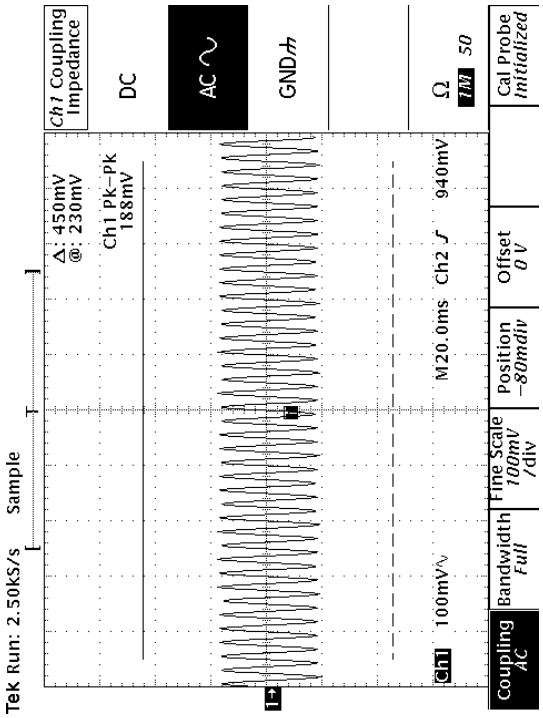
Probing Point	Probing Location on the board	Probed Absolute Power (dBm) or gain/loss (dB) or voltage (v)	Where to start checking if RF power not correct (soldering, shorts, DC power applied if active, correct voltage of DC signals, otherwise replace)
UEM (D200) out=Robin (N601) in	1, Figure 1	Use O-scope. For CDMA modulation turned on, 550 mV p-p, looks like noise. For AMPS, with test tone turned on.	D200, N601 (VR2,3,6,IO)

Table 2: RF/Analog Probing for Transmitter

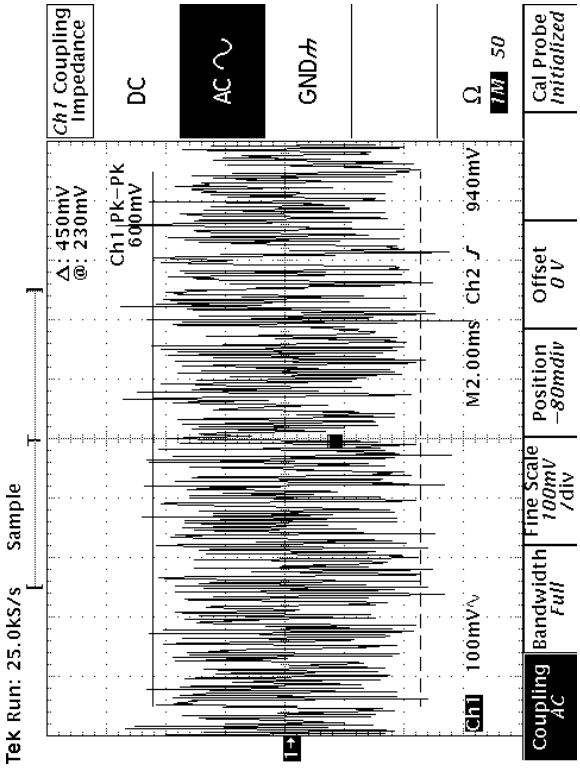
Probing Point	Probing Location on the board	Probed Absolute Power (dBm) or gain/loss (dB) or voltage (v)	Where to start checking if RF power not correct (soldering, shorts, DC power applied if active, correct voltage of DC signals, otherwise replace)
Robin (N601) out=Balun (T604) in	2a and 2b, Figure 1	Easiest to probe on balun output as per Table 1. Nominal loss through balun = 1 dB, but it will appear as 3-4 dB gain due to impedance difference. On Robin output, you may see amplitude imbalance between 2 sides of probing point 2 due to impedance differences (less in Cell).	N601 (ensure VREFRF02 is 1.35v. Check AGC voltages/PDMs), T604, L604, L603, C640, C642, C620, N603 (including check for 3.6v on pin 5), D400 (including AGC voltage)
Balun (T604) out=Tomcat (N603) in	3, Figure 1	See Table 1	T604, L613, C640, C642, L603, L604, N601. C620, N603 (including: check PD_CELL high as in Table 2), N603 (including check for 3.6v on pin 5 and 2.6v on pin 4)
Tomcat (N603) out = TX SAW filter (Z604) in	4, Figure 1	Gain = 12-16 dB through Tomcat	N603 (also ensure 3.6v on pin 5 and PD_CELL high as in Table 1b), N601, C649, C639, Z604, N801 (Vbat)
TX SAW filter (Z604) out = cell PA (N801) in	5, Figure 1	Loss = 2-3 dB through SAW filter	Z604, N603, N801 (Vbat)
Cell PA (N801) out = cell isolator (Z802) in	6, Figure 1. Probing here not recommended unless necessary; best to measure on RF connector	PA has variable gain, see Table 1. Best to measure on RF connector.	N801 (including: check 3.6v on Vbat, Z802, R821, R801, R804, L801, C805, R806, R805, V801), D400 (including AGC voltage), N601 (since Iref, also check PA_AGC).
Cell isolator (Z802) out = cell duplexer (Z803) in	7, Figure 1. Probing here not recommended unless necessary; best to measure on RF connector	Loss = 0.6 dB through isolator. Best to measure on RF connector as in Table 1	Z802, N801 (Vbat), R821, R801, Z803
Cell duplexer (Z803) out	8, Figure 1. Probing here not recommended unless necessary; best to measure on RF connector	Loss = 1.3 dB through duplexer	Z802, C801, L812, X800. If no cable connected to X800, then additionally: L802, R823, L803, R824

Table 2: RF/Analog Probing for Transmitter

Probing Point	Probing Location on the board	Probed Absolute Power (dBm) or gain/loss (dB) or voltage (v)	Where to start checking if RF power not correct (soldering, shorts, DC power applied if active, correct voltage of DC signals, otherwise replace)
UHF LO at 1009.62 MHz for channel 384	10, Figure 1. Can probe on top of plastic to check for presence of LO, but won't read accurate power	Power approx. -3 dBm	If LO is present but off freq (could be off by hundreds of MHz), then VCO G502 is at least putting out a signal. If LO not present, check G502, R507, R505, R515 first. Else, check C511, C501, C532, C550, R550, C509, R503, C508, R508, C518, N501, R506, C516, C515, C521, R513, C504. Lastly, check R523, R519, R509.
VHF LO at 346.2 MHz for cell band, any channel	11, Figure 1 (You can touch top of plastic to verify presence of LO, but this won't measure amplitude accurately.)		N601, C612, C613, R607, R605, C632, R606, C618, R609, C629, V602, C637, V601, C630, C631, L611, C638, R604, R601, R602



Voltage on Robin UEM output for mode with test turned on



Voltage on UEM output for mode

Table 3: DC Probing for Transmitter

Item to check	Setting	DC probing location on board	DC voltage	Items to check if voltage incorrect
TX RF AGC	See Table 1	12, Figure 3	See Table 1	D400 (UPP), R433, C426, R434, C427, C429, V420, N601
TX IF AGC	See Table 1	13, Figure 3	See Table 1	D400 (UPP), R427, C422, R428, C423, C430, V421, N601
PA AGC	See Table 1	14, Figure 3	See Table 1	D400 (UPP), R430, C424, R431, C425, C431, V422, N601
PD_CELL	High for TX on, Low for TX off	49, Figure 1	High = 2.6v Low - 0v	N601, C649, N603
VREFRF02	fixed	50, Figure 1	1.36v	D200, C606, N601

Table 4: Receiver Probing (PDM and voltage)

	PDM lower limit	PDM upper limit	PDM mean	Voltage for PDM mean	RX power in
AMPS ch 384 LowGain	2	102	55	0.98	-65 dBm

Table 4: Receiver Probing (PDM and voltage)

	PDM lower limit	PDM upper limit	PDM mean	Voltage for PDM mean	RX power in
AMPS ch 384 HighGain	127	215	173	1.19	-65 dBm
CELL ch 384 LowGain	-1	106	60	0.99	-65 dBm
CELL ch 384 HighGain	-119	-3	-64	0.78	-95 dBm

7 RSSI should be within +/- 2 dB of actual RX signal above -104 dBm and +2/-4dB below -104 dBm

8 In AMPS, ensure 230 mV on I,Q traces of Batman out, probing point 38 of Figure 3.

9 Use CW signal for AMPS, use CDMA signal for CELL. Call box can generate both

Table 5: RF Probing for Cell CDMA and AMPS Front-end Receiver

Probing point	Probing location on the board	Probed Absolute Power (dBm) or gain/loss (dB)	What to check if RF power not correct (soldering, shorts, DC power applied if active, correct voltage of DC signals, otherwise replace)
Cell duplexer (Z803) out = Alfred (N750) in	32, Figure 1	Loss = 2-4 dB through duplexer	Z803, L750, N750 (VRX)
Alfred (N750) LNA out = cell RX saw (Z751) in	33, Figure 2	Gain = 12-14 dB for high gain mode (GAIN_CTL=high. Use RF AGC status window to monitor state) Loss = -3 to -5dB for low gain	N750. Also, IF_SEL low for CDMA and high for AMPS. Ensure GAIN_CTL high if RX power is below the LNA switch point. Z751, C755, L752, C757, R721, C753, R723, C756
Cell RX saw (Z751) out = Alfred (N750) mixer in	34, Figure 2	Loss = -1-3 dB through SAW filter	Z751, N750, R722, C750, R723, C756, L757, C758
UHF LO at 1009.62 MHz in Cell CDMA/AMPS for channel 384	10, Figure 1 Can probe on top of plastic to check for presence of LO, but won't read accurate power	Approx -3 dBm	If LO is present but off freq (could be off by hundreds of MHz), then VCO G502 is at least putting out a signal. If LO not present, check G502, L509, R505, R515 first. Else, check C511, C501, C532, C550, R550, C509, R503, C508, R508, C518, N501, R506, C516, C515, C521, R513, C504. Lastly, check R523, R519, R509

Table 6: RF Probing for AMPS back-end Receiver

Probing point	Probing location on the board	Probed Absolute Power (dBm) or gain/loss (dB)	What to check if RF power not correct (soldering, shorts, DC power applied if active, correct voltage of DC signals, otherwise replace)
Alfred (N750) mixer out = AMPS RX IF saw (Z752) in	36, Figure 2	This point not 50 ohms. Will measure approx. -28 dBm for -52 dBm input and RX AGC PDM = 225	N750. IF_SEL low for CDMA and high for AMPS. R722, C750, L771, R723, C756, L770, L757, C758, L755, C769, C766, C784, L764, C781, Z752
AMPS RX IF filter (Z752) out = Batman (N701) in	37, Figure 2	This point not 50 ohms. Will measure approx -46 dBm for -52 dBm input and RX AGC PDM = 225	Z752, L765, C777, L766, C778, L768, L767, C779, N701 (VR5, VR7, VIO)
Batman (N701) out = UEM (D200) in	38, Figure 3	RSSI most useful	N701 (VR5, VR7, VIO, ensure 1.35v on VREFRF01; also check RX_IF_AGC), R706, C704, R705, R704, V701, C716, L701, C702, C715, R702, C714, R703, C701
VHF LO at 256.2 MHz	39, Figure 2		N701, C701, C714, R703, R702, C715, R704, V701, C716, L701, C702, R705, C706

Table 7: DC Probing for Receiver

Item to check	Setting	DC probing location on board	DC voltage	Items to check if voltage incorrect
RX IF AGC	See PDM settings	40, Figure 3	See typical voltages	D400, R436, C428, C435, N701
GAIN_CTL	High = LNA high gain Low = LNA low gain	55, Figure 2	High = 2.4v min Low = 0.3v max	N701, N750, R721, C753
IF_SEL	High = AMPS Low = CDMA	57, Figure 2	1.35v	D200, C706, N701

Table 8: RF Probing for Cell CDMA Back-end Receiver

Probing point	Probing location on the board	Probed Absolute Power (dBm) or gain/loss (dB)	What to check if RF power not correct (soldering, shorts, DC power applied if active, correct voltage of DC signals, otherwise replace)
Alfred (N750) mixer out = CDMA RX IF saw (Z753) in	46, Figure 2	This point not 50 ohms. Will measure approx. -14 dBm for -52 dBm input and RX AGC PDM = 225	N750 and supporting components (ensure BAND_SEL low for Cell CDMA and high for PCS as in Table 3d. Also, IF_SEL low for CDMA), L754, C782, C767, C761, C786, Z753
CDMA RX IF saw (Z753) out = Batman (N701) in	47, Figure 2	This point not 50 ohms. Will measure approx. -47 dBm for -52 dBm input and RX AGC PDM = 225	Z753, N750 and supporting components (including check for proper voltages on Alfred signaling), L754, C782, C767, L759, C770, C771, C772, L760, L761, N701
Batman (N701) out = UEM (D200) in	38, Figure 3	Easiest to use RSSI	N701 (VR5, VR7, VIO, ensure 1.35v on VREFRF01), R705, C704, R706, C706, C701, C714, R703, R702, C715, R704, V701, C716, L701, C702
VHF LO at 256.2 MHz	39, Figure 2		N701, C701, C714, R703, R702, C715, R704, V701, C716, L701, C702, R705, C706

Table 9: RF DC Power Supplies

Supply	Voltage	Supplied Components
VR1A	4.75	VCTCXO, UHF PLL
VR1B	4.75	Robin
VR2	2.78	Robin, Power Detector
VR3	2.78	Robin, VCTCXO
VR4	2.78	UHF PLL
VR5	2.78	Batman
VR6	2.78	Robin, UHF PLL
VR7	2.78	Batman
VIO	1.8	Robin, UHF PLL
VRX	1.8	Alfred
VPLL	2.78	UHF PLL
VBAT	3.1-4.2	PA

Probing Diagrams

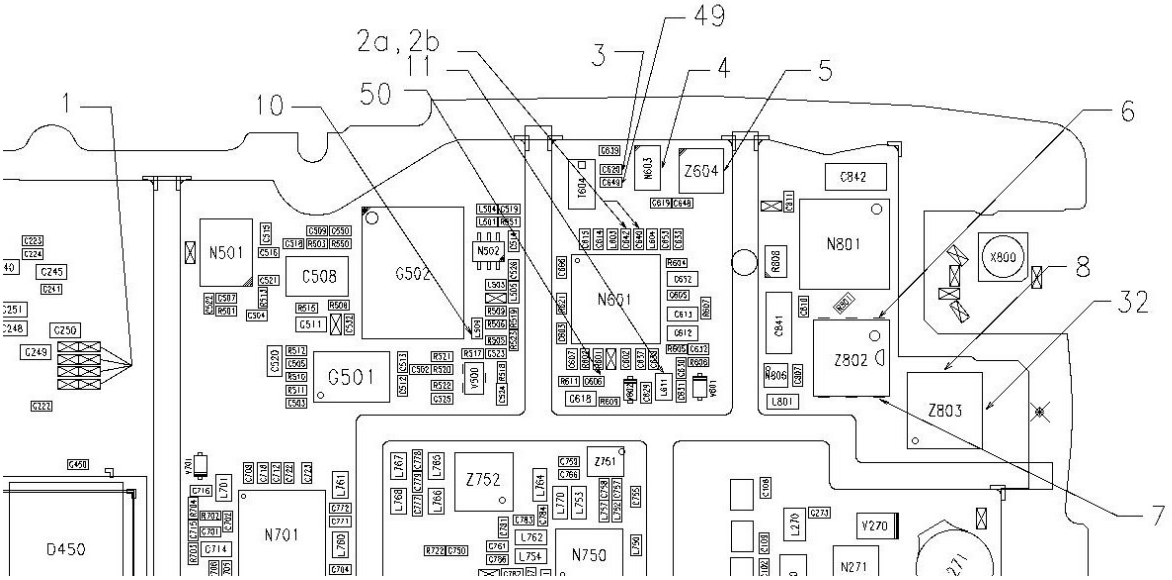


Figure 1: Test Points

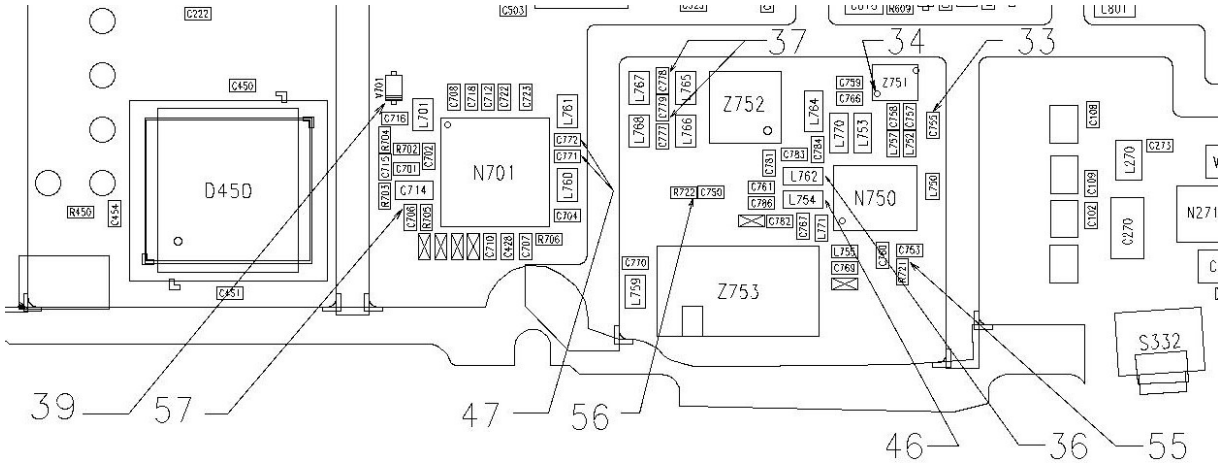


Figure 2: Test Points

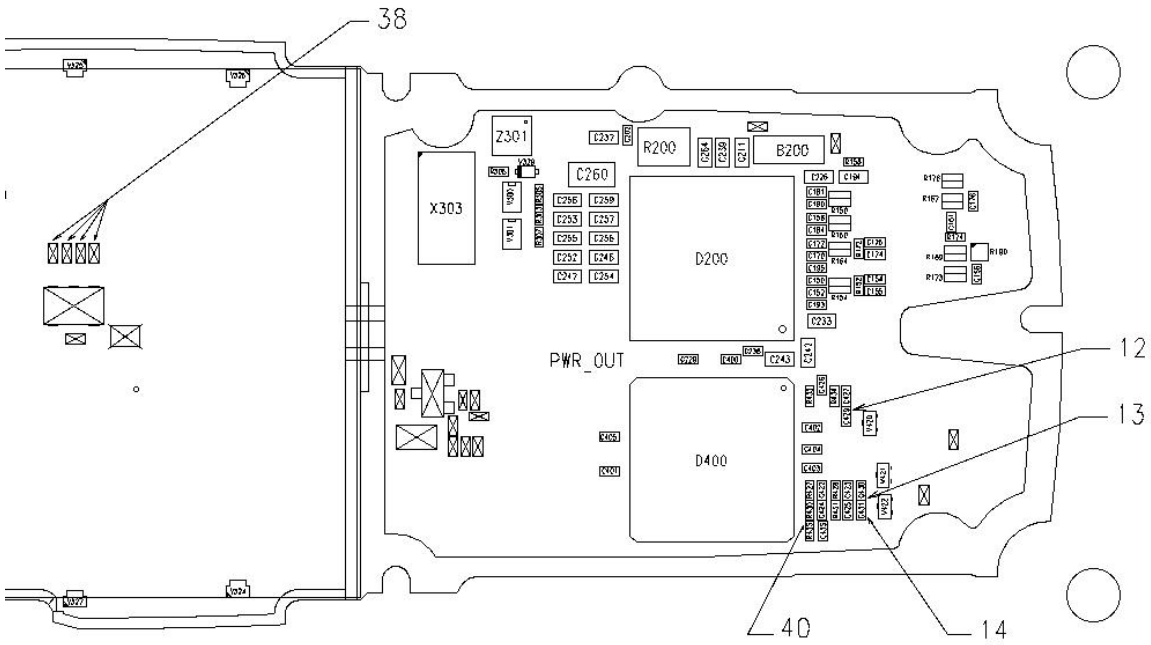
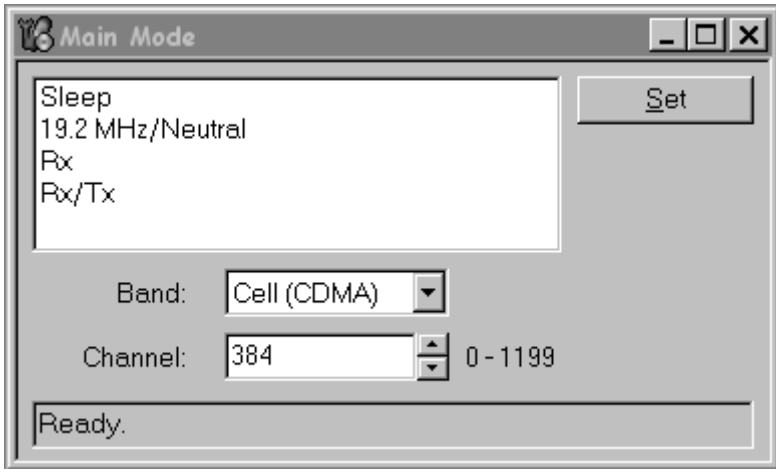


Figure 3: Test Points

Phoenix Instructions

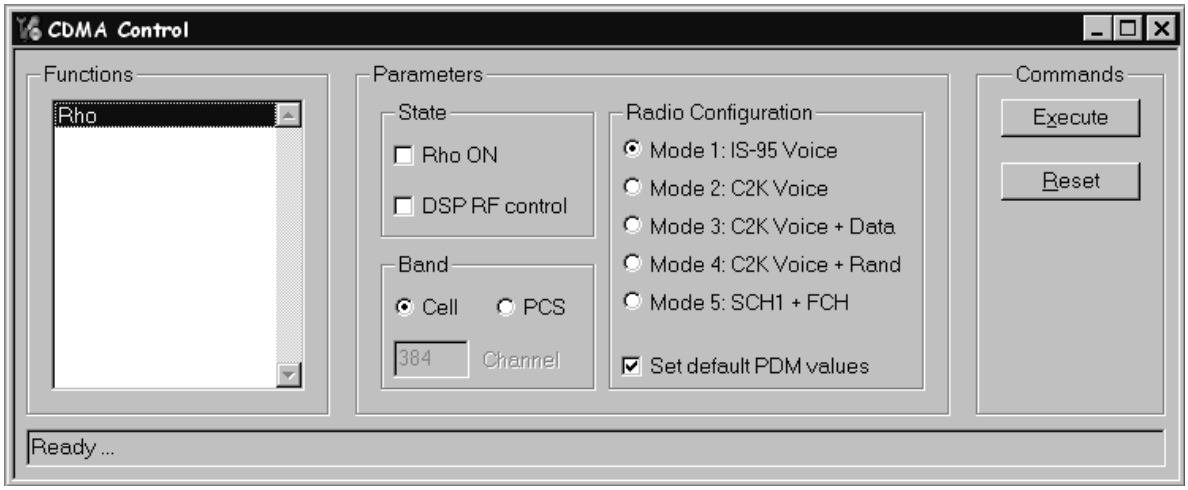
Turning on Cell CDMA Transmitter

From the RF menu, select Main Mode from the drop-down menu. This opens the "Main Mode" dialog box.



To turn on the transmitter, first turn on the carrier by highlighting "RX/TX" in the top subwindow. (This also turns on the receiver.) Enter the appropriate channel in the "Channel" subwindow and then click the **Set** button in the upper righthand portion of the dialog box.

Next, turn on the modulation by opening the "CDMA Control" dialog box from the DSP drop-down menu. The dialog box is shown here.

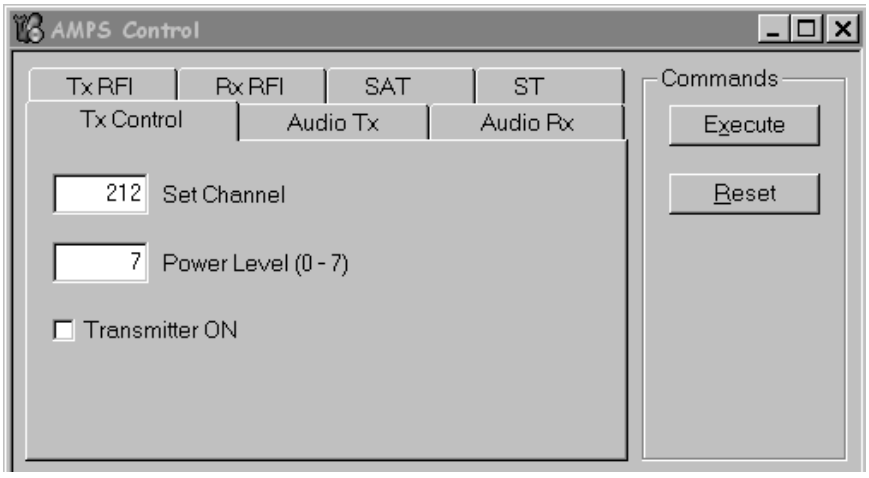


Highlight "Rho" in the Functions subwindow at left, and check "Rho ON" in the State field. Check either "Cell" or "PCS" in the Band field. Under Radio Configuration, choose the desired configuration. (Note: C2K is an abbreviation for IS2000.) When you have completed all the necessary information, click the **Execute** button.

Turning on AMPS Transmitter

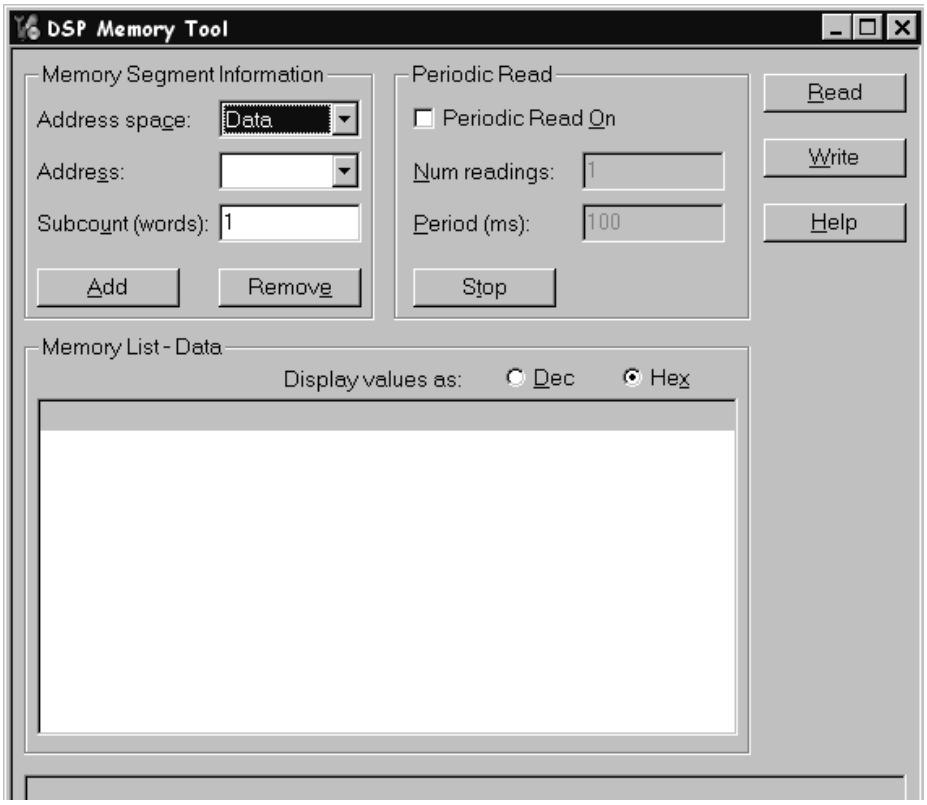
Eventually, the method will be to use the "RF Main Mode" window, choosing "AMPS" in the Band field. However, a current software problem exists with this method with the result that once the AMPS transmitter is turned on in this manner, it does not respond correctly to AGC PDM adjustment.

As a temporary solution, the "AMPS Control" dialog box, shown here, can be used.



Select the desired channel and power level, and check "Transmitter ON". Click the **Execute** button.

Note: The reason why this is a temporary solution is because, in some instances, the AFC and AGC are not disabled. The result is that the signal will not be stable in frequency and will not respond to AGC PDM adjustment. If this is the case, manually disable the AFC and AGC using the "DSP Memory Tool" dialog box, shown here.



Choose the "Data" option in the Address space field; enter the address; leave the Subcount (words) field entry at "1"; click the **Add** button. The address will be displayed in the subwindow in the lower half of the dialog box.

Use this method to enter both the AFC Disable and AGC Disable addresses.

Note: AFC Disable and AGC Disable addresses may be obtained from R&D. These addresses may change, depending upon software version.

Once both addresses are entered, check "Periodic Read on" and click the **Stop** button.

Click the **Read** button, which then displays the values in both addresses.

Note: Both addresses should be "1".

Change both addresses to "0" by clicking on the "1", which highlights the data in the address. Next, you can edit the contents and make the change from "1" to "0". Click the *Return key* on your keyboard to enter the new values. Once the contents of both addresses are changed to "0", click the **Write** button on the "DSP Memory Test" dialog box. This will write the new values into the phone. This data will remain in the phone until the phone is powered down.

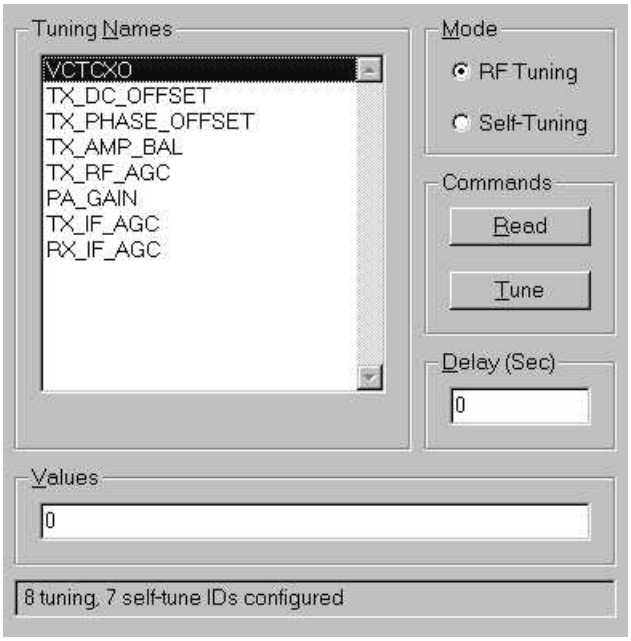
Turning on Receiver Only

To turn on the receiver only, use the "Main Mode" dialog box as described in the **Turning on Cell CDMA Transmitter** section. Highlight "RX" in the Band field and then choose "Cell CDMA".

Verifying a Single Manual Tuning

Open the "RF Tuning" dialog box, shown here.

Note: The tuning descriptions given in the Tuning *section describe the tuning process and provide information as to what values will be returned to you from the phone, if any.*



According to these descriptions, click "Self-Tuning" for self tunings or "RF Tuning" for the others. Choose the appropriate test from the "Tuning Names" list. Values that you must enter are entered into the Values subwindow. If more than one value is entered, enter a delay time (in seconds) in the Delay (Sec) field. This indicates the delay between applications of the multiple values entered. Three seconds is sufficient time for all tests to run; however, in certain cases, you may want to increase the delay in order to closely observe the phone's behavior during the tuning.

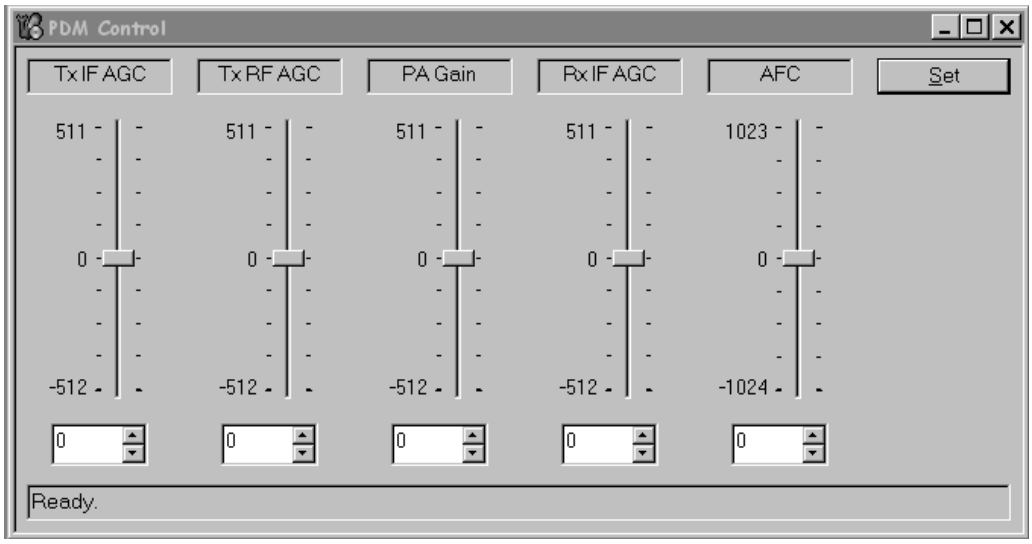
Any data returned from the phone is displayed on the status line (the grayed box at the bottom of the dialog box). If no tuning value is returned, this line will indicate if the tuning was successful or not.

To begin a tuning, click the **Tune** button.

Adjusting PDM Values for AGCs and AFC

The following "PDM Control" dialog box has several sliders—one each for each of the AGCs and the AFC. Use your mouse to move the slider pointer to the value that you want to set. (Values are indicated in decimal format.) When completed, click the **Set** button.

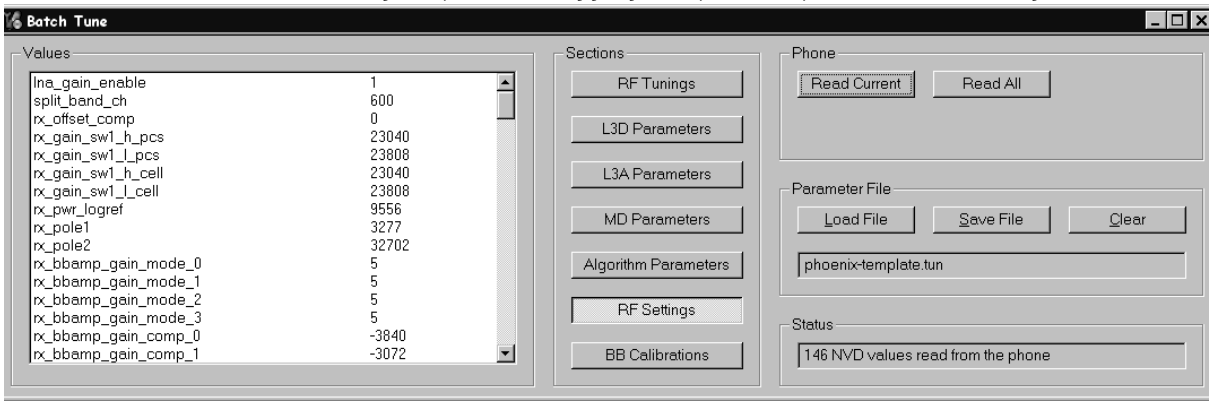
(Alternatively, you can click the up and down arrows next to the value fields below the sliders. This will increase or decrease the value one step at a time. If you use this method, you do not have to click the **Set** button.)



Reading Tuning Values from the Phone

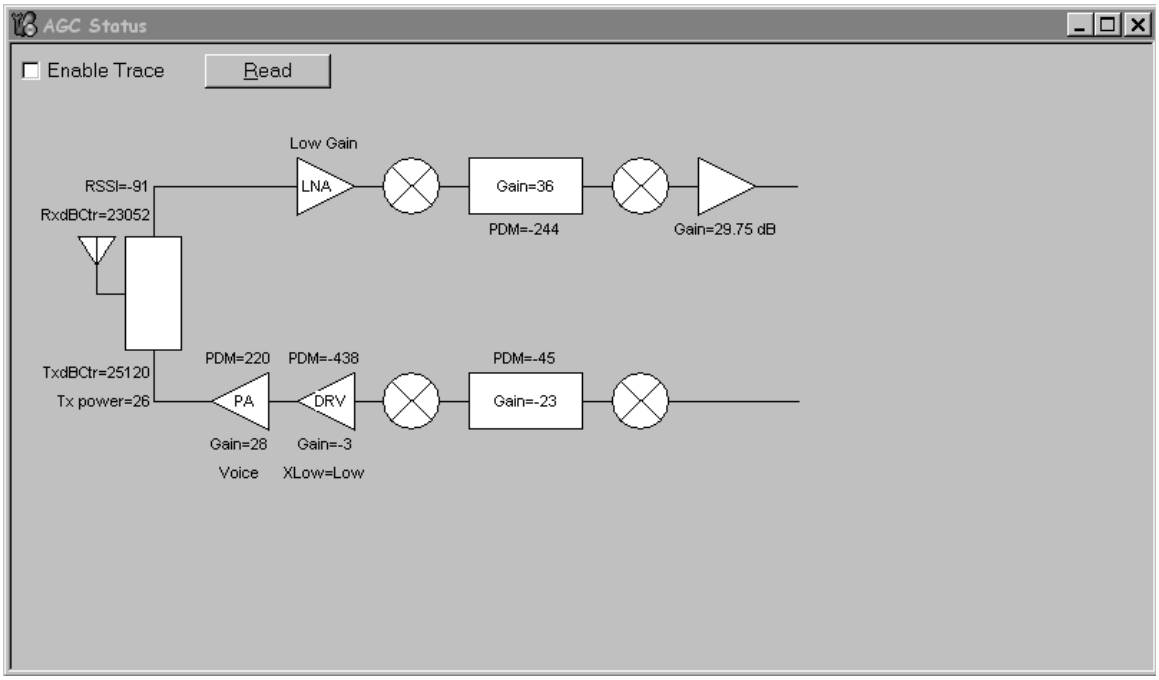
Open the "Batch Tune" dialog box, shown here. To read the tuning values from the phone, click the **Read All** button under the Phone heading. However, if you want the tuning values to be displayed, you must first load the template file by clicking the **Load File** button, which is located under the Parameter File heading.

Note: Ensure that the template file used is appropriate for the software version in the phone.



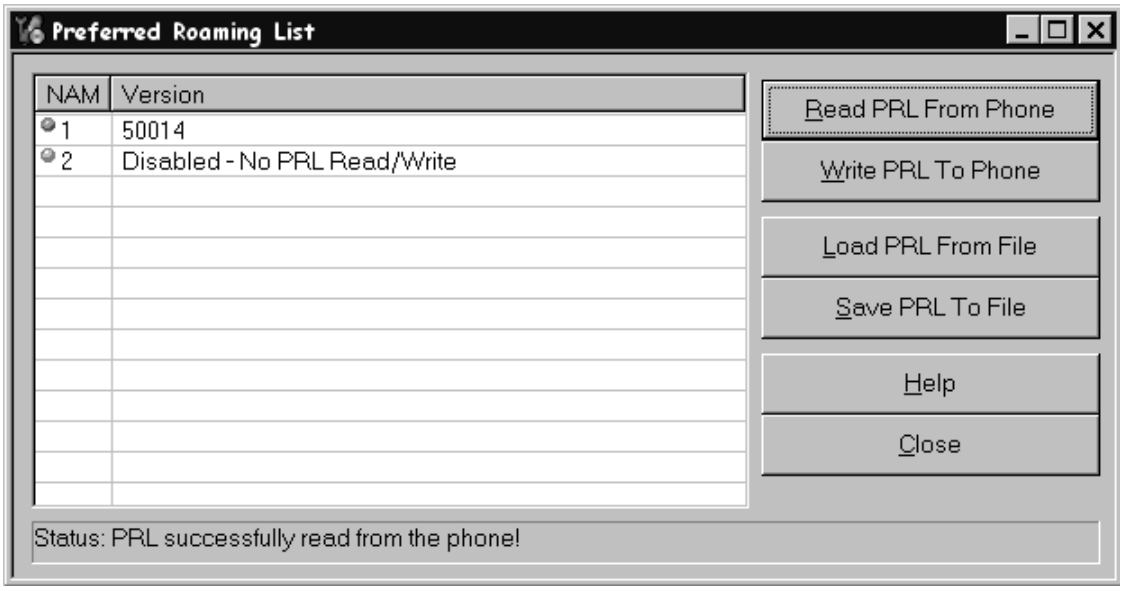
Reading RSSI and AGC PDM Values from the Phone

Open the "AGC Status" dialog box. Check the "Enable Trace" box. RSSI is the value near the antenna on the receiver side. The AGC PDM values are shown beside their respective variable gain amplifier in the block diagram. The TX AGC PDMs are, as shown in the following diagram from right to left, IF_AGC, RF_AGC, PA_AGC.



Loading PRLs into the Phone

Using the "Preferred Roaming List" dialog box, click the **Load PRL From File** button and choose the desired file from the list that displays in the left side of the dialog box. (When you choose your desired file, note that the text color changes to blue.) Click the **Write PRL To Phone** button. At the bottom of the dialog box, a status message will indicate if the file was loaded correctly.



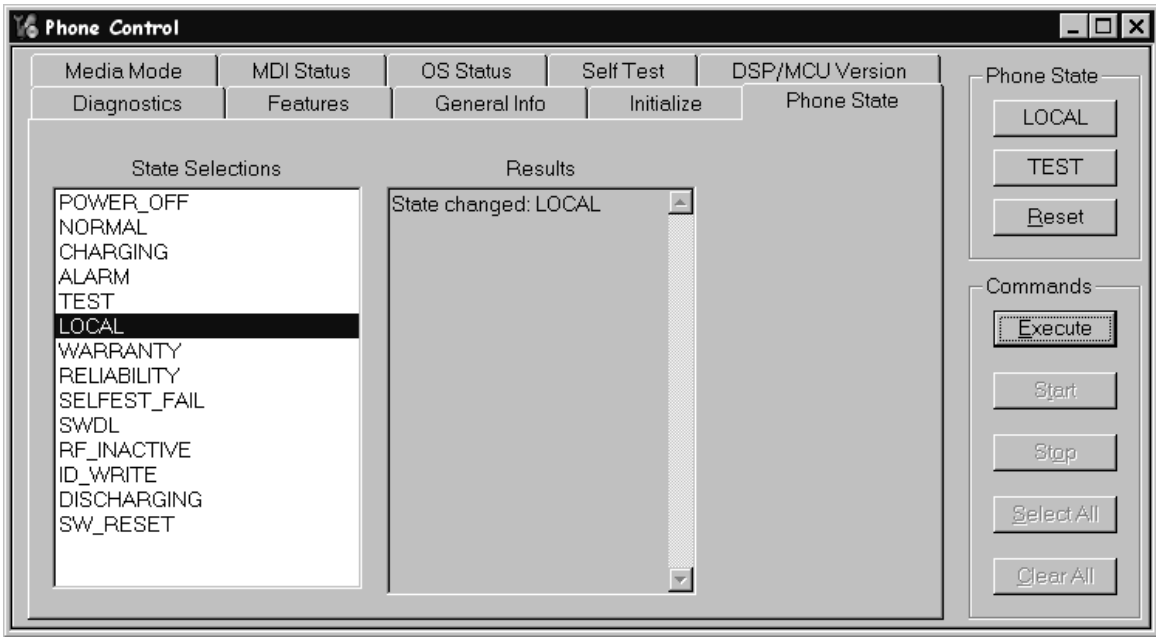
Changing Between Local Mode and Normal Mode

To make a call, the phone should be in normal mode. When in normal mode, the phone software is running, and the phone will search for a pilot.

To troubleshoot so that you can manually control the phone (not in a call), the phone

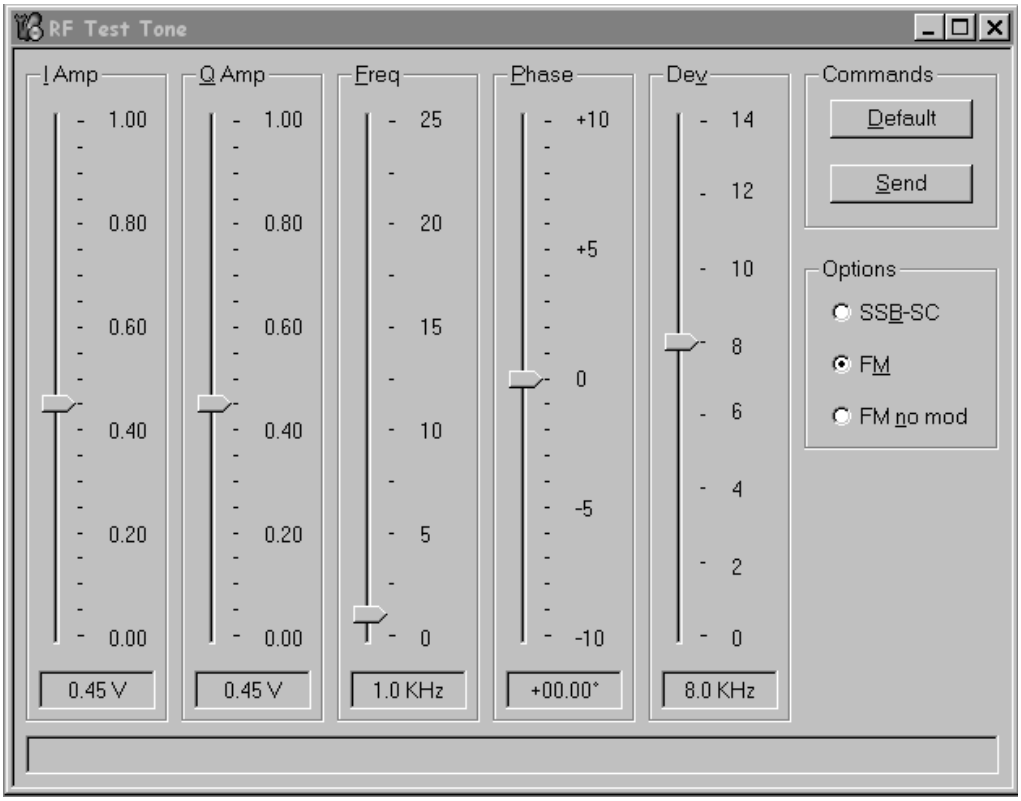
should be in local mode. When in local mode, the phone's software is not running, and it will not search for a pilot.

To switch between normal and local modes, use the "Phone Control" dialog box, shown here. This setting will be lost if the phone is powered down.



Baseband Test Tone for AMPS Transmitter Tests

To add a baseband test tone to the AMPS transmitter, open the "RF Test Tone" dialog box, shown here, and set the parameters as desired.



Block Diagrams

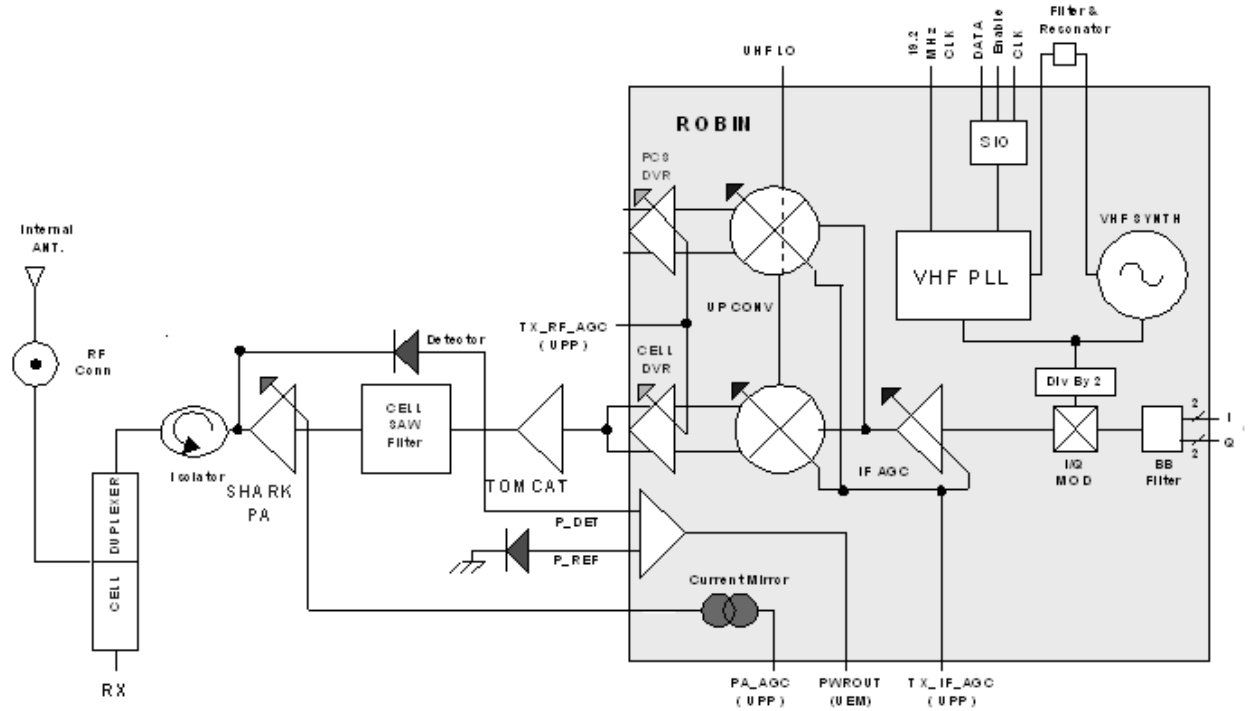


Figure 4: Transmitter Block Diagram

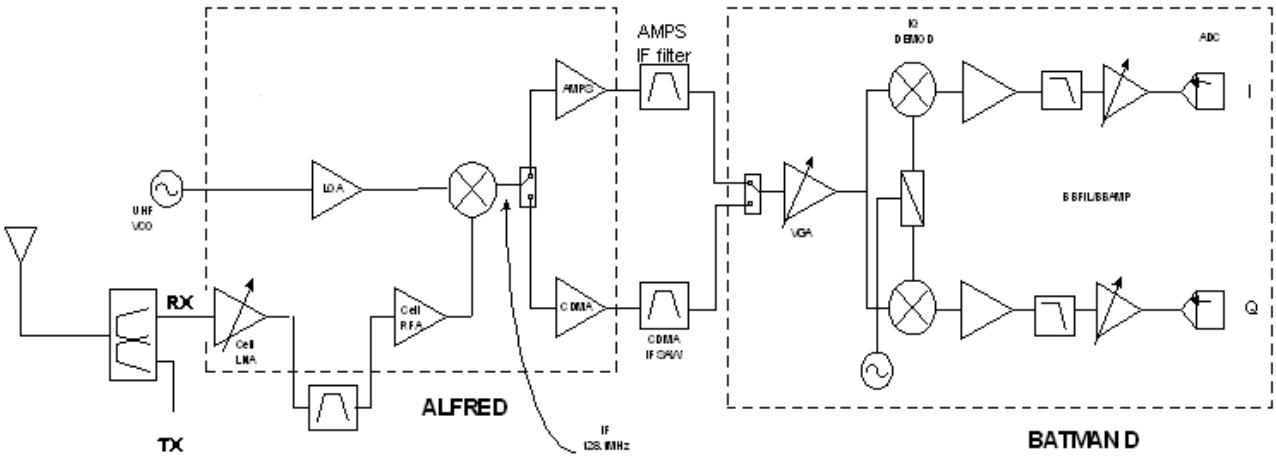


Figure 5: Receiver Block Diagram

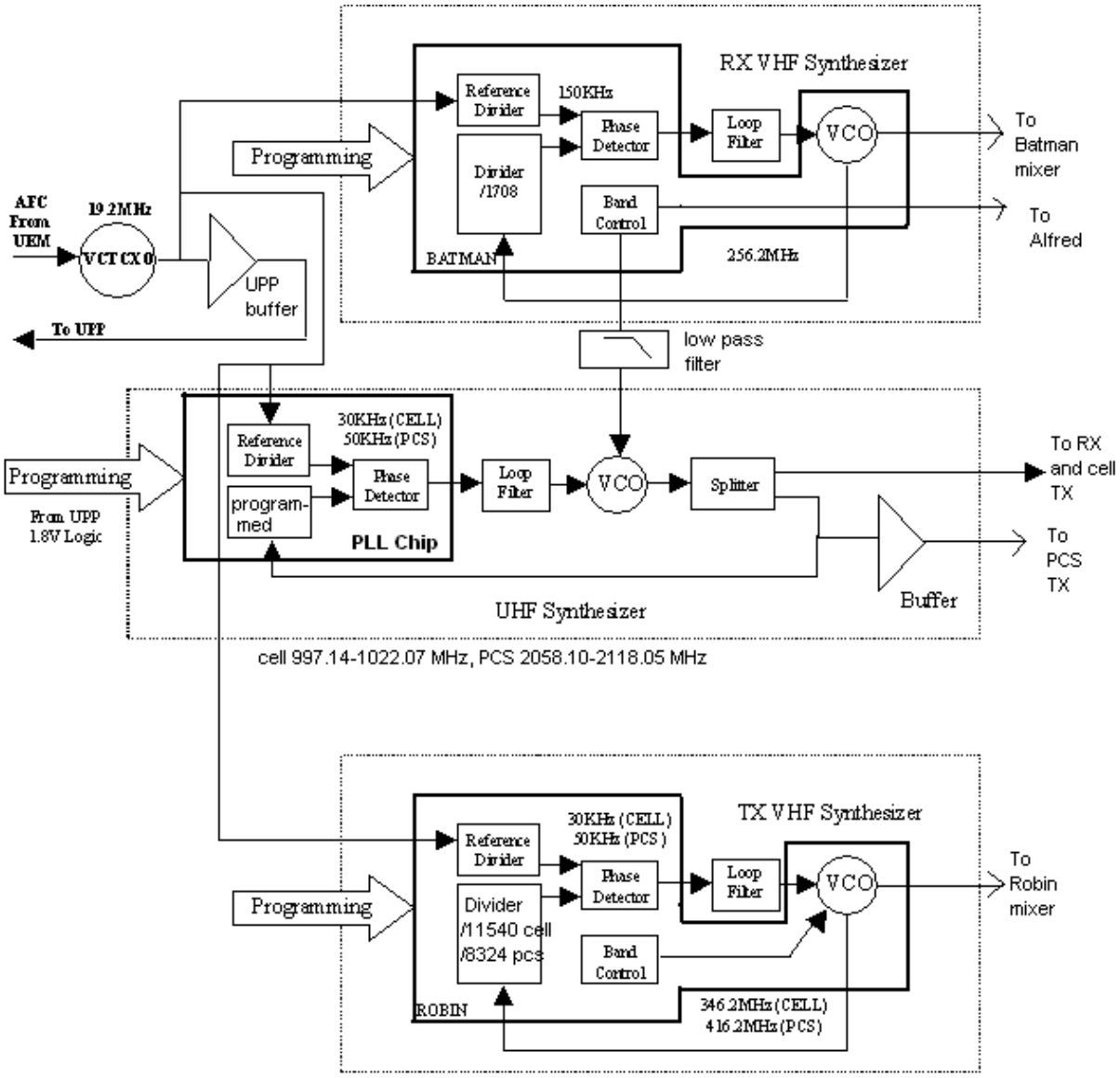


Figure 6: Synthesizer Block Diagram

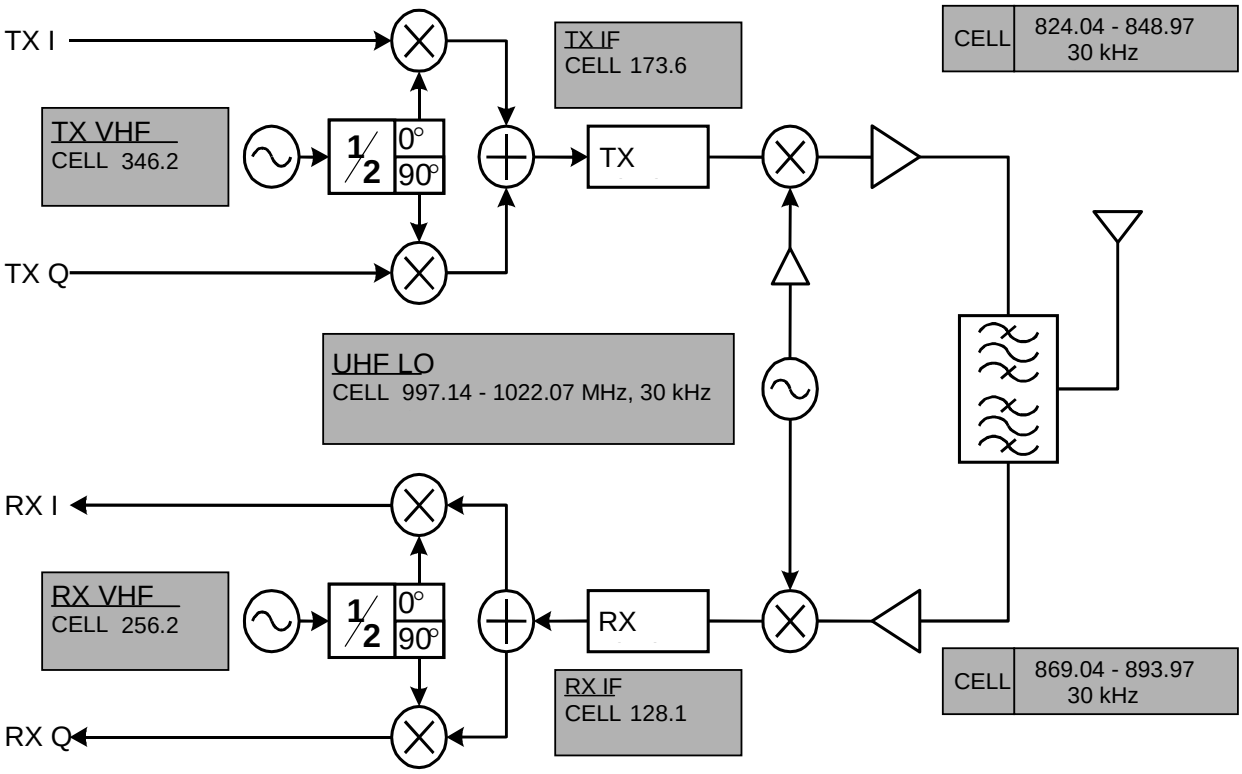


Figure 7: Frequency Plan

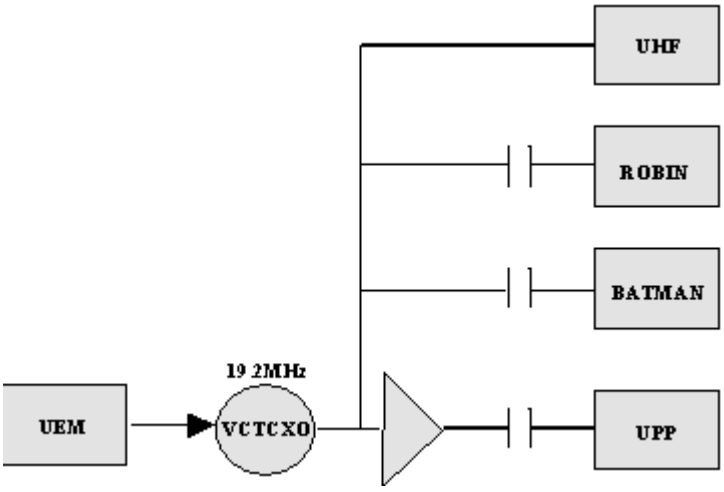


Figure 8: Distribution of VCTCXO tone at 19.2 MHz

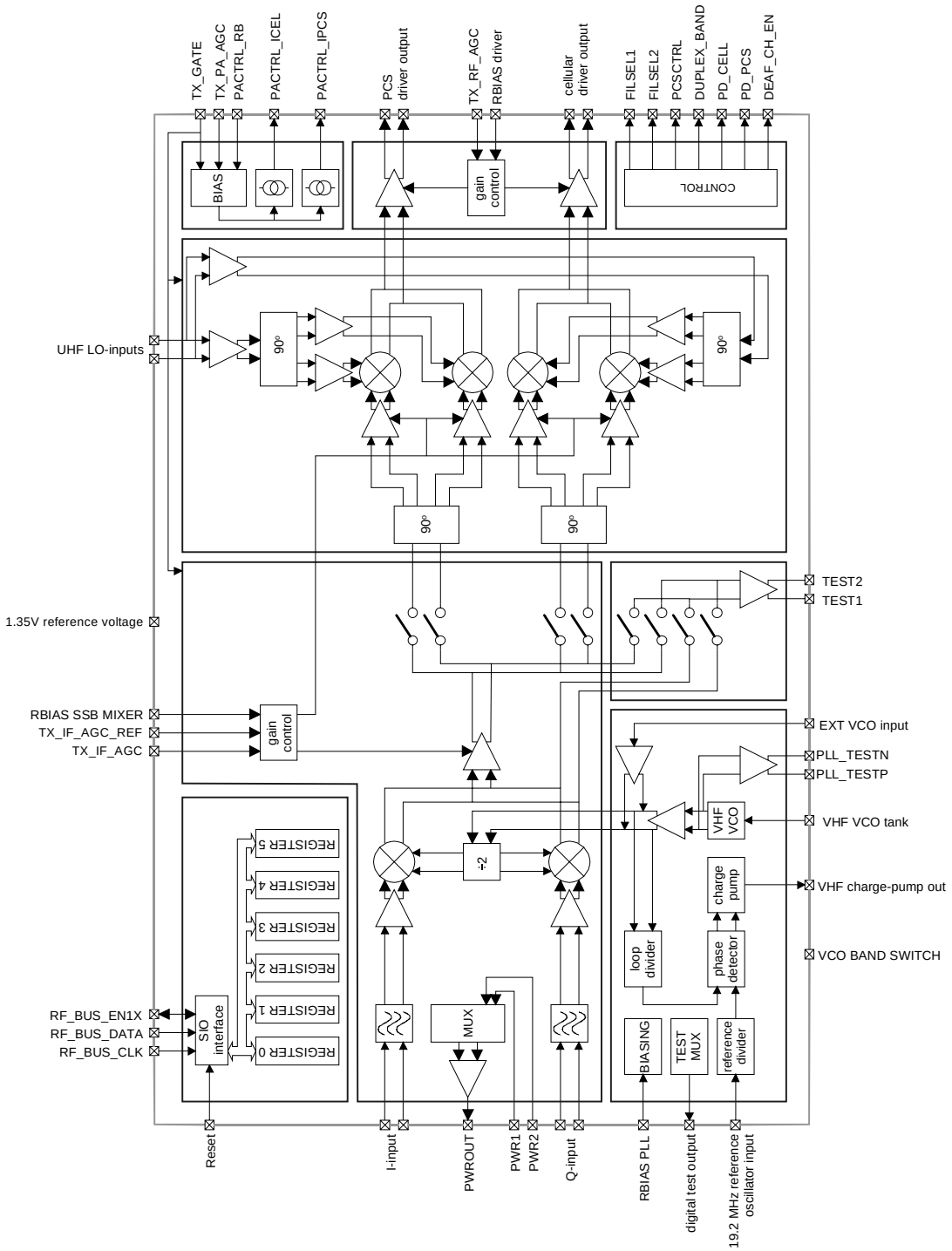


Figure 9: Detailed Robin Block Diagram

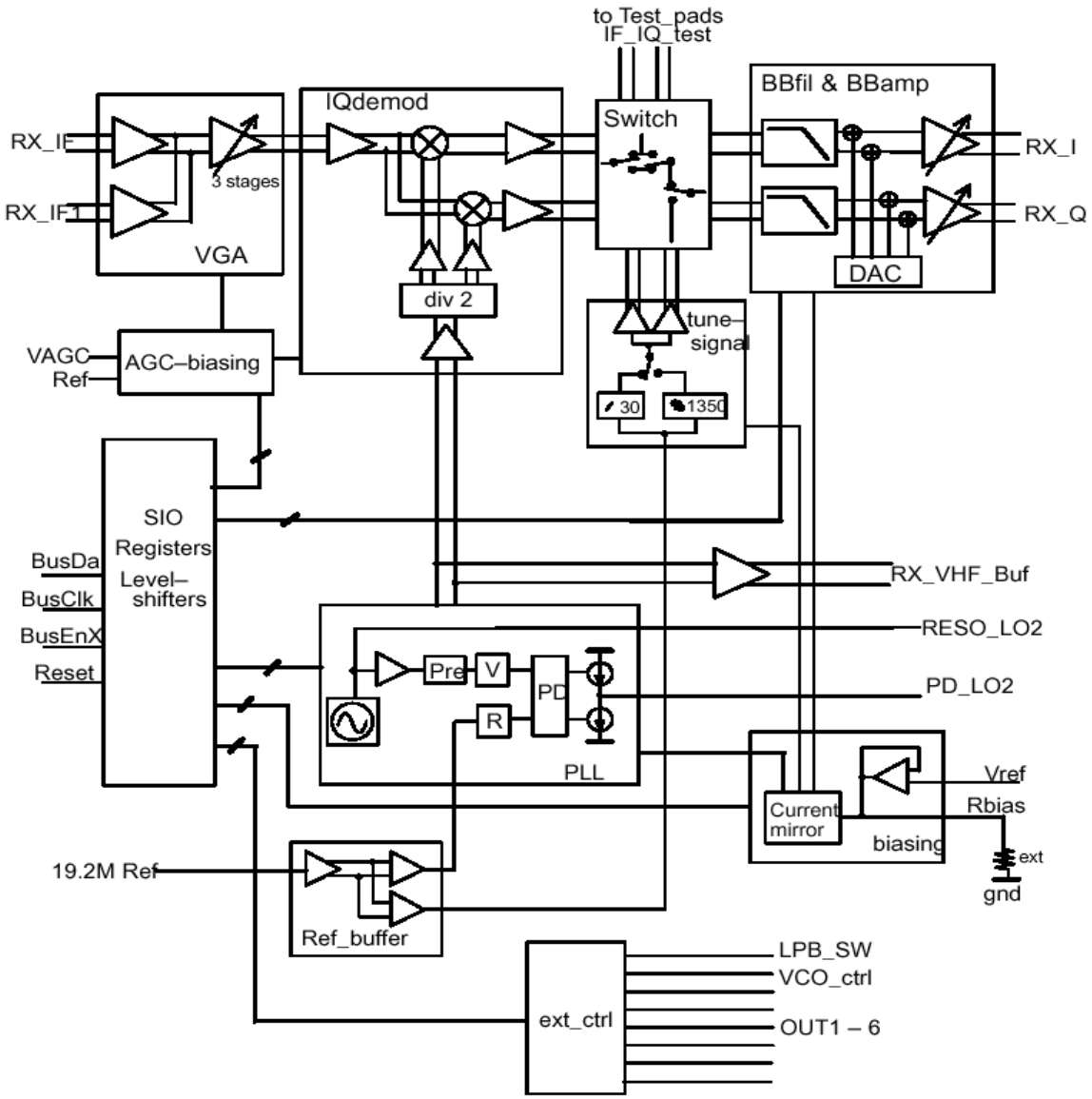


Figure 10: Detailed Batman Block Diagram

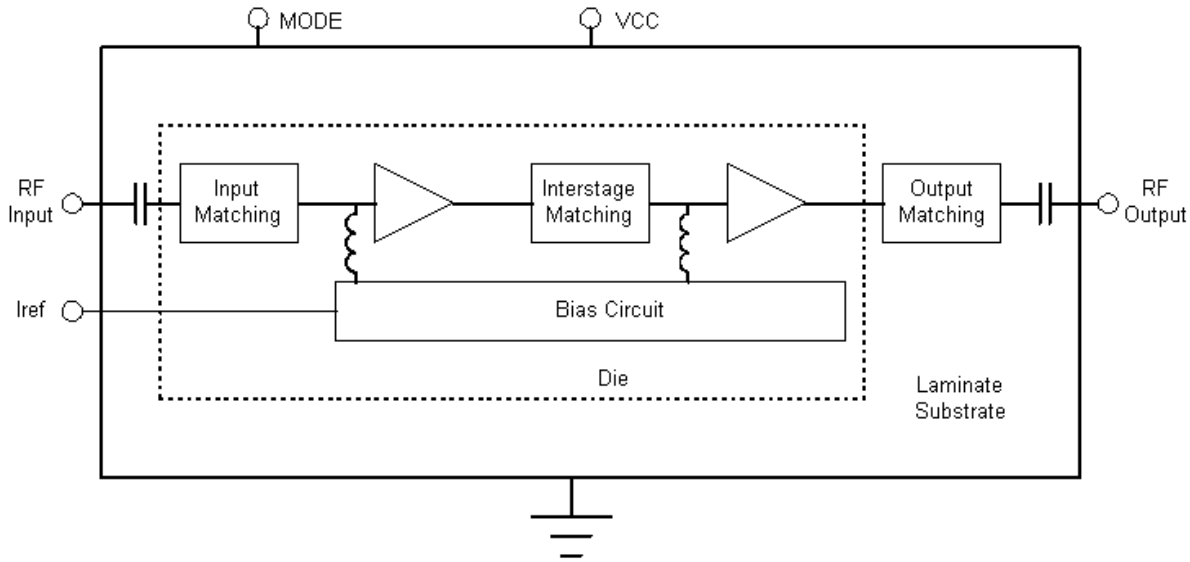


Figure 11: Block Diagram for both Shark (Cell, AMPS, PA)

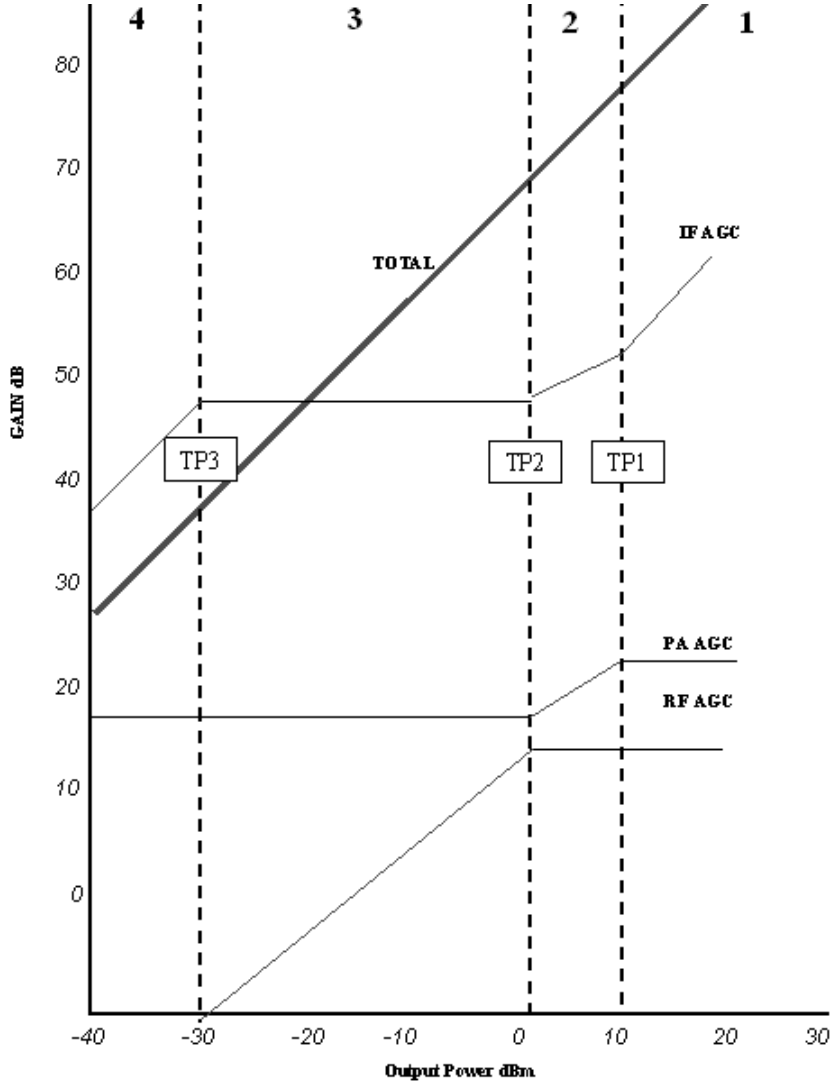


Figure 12: CDMA AGC Algorithm

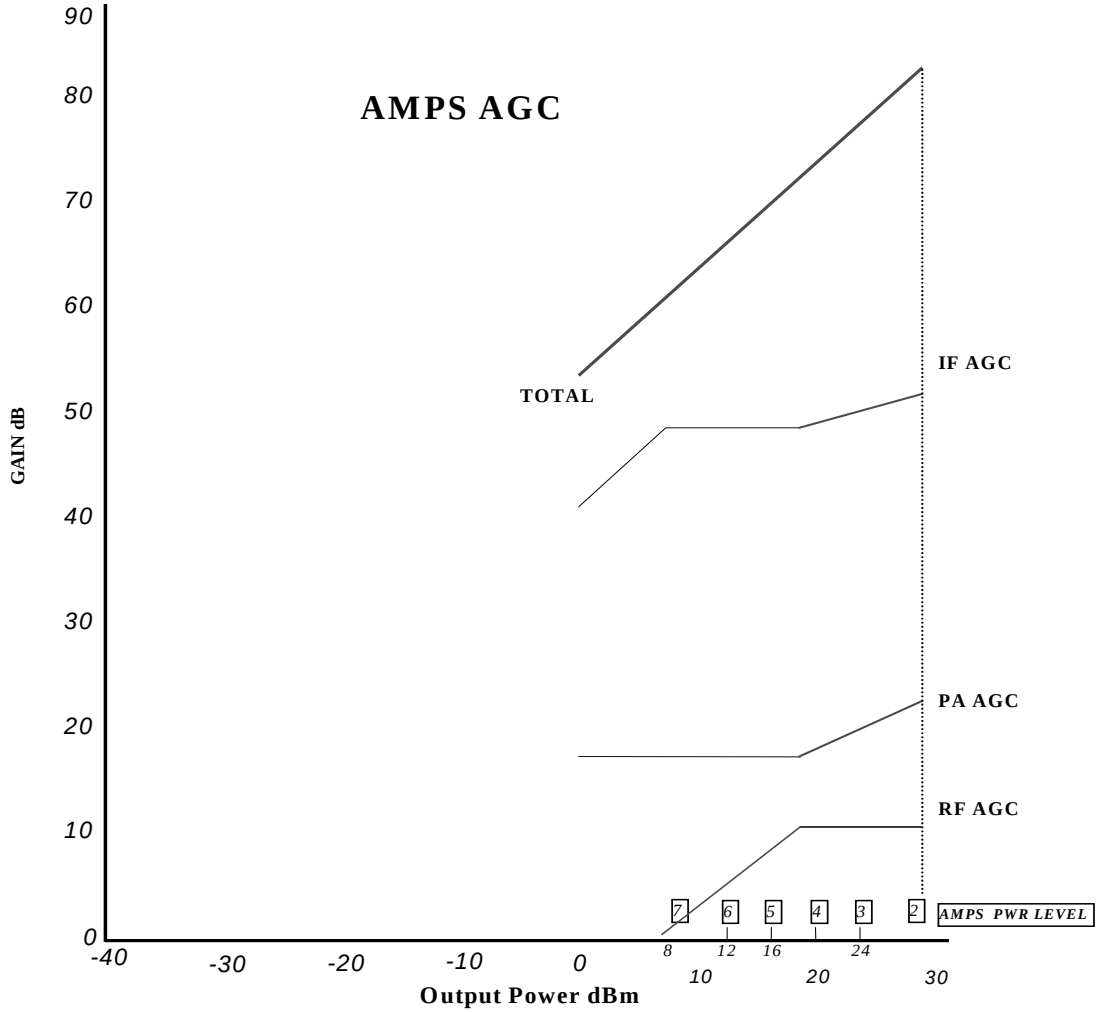


Figure 13: AMPS AGC Algorithm